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December, 1960

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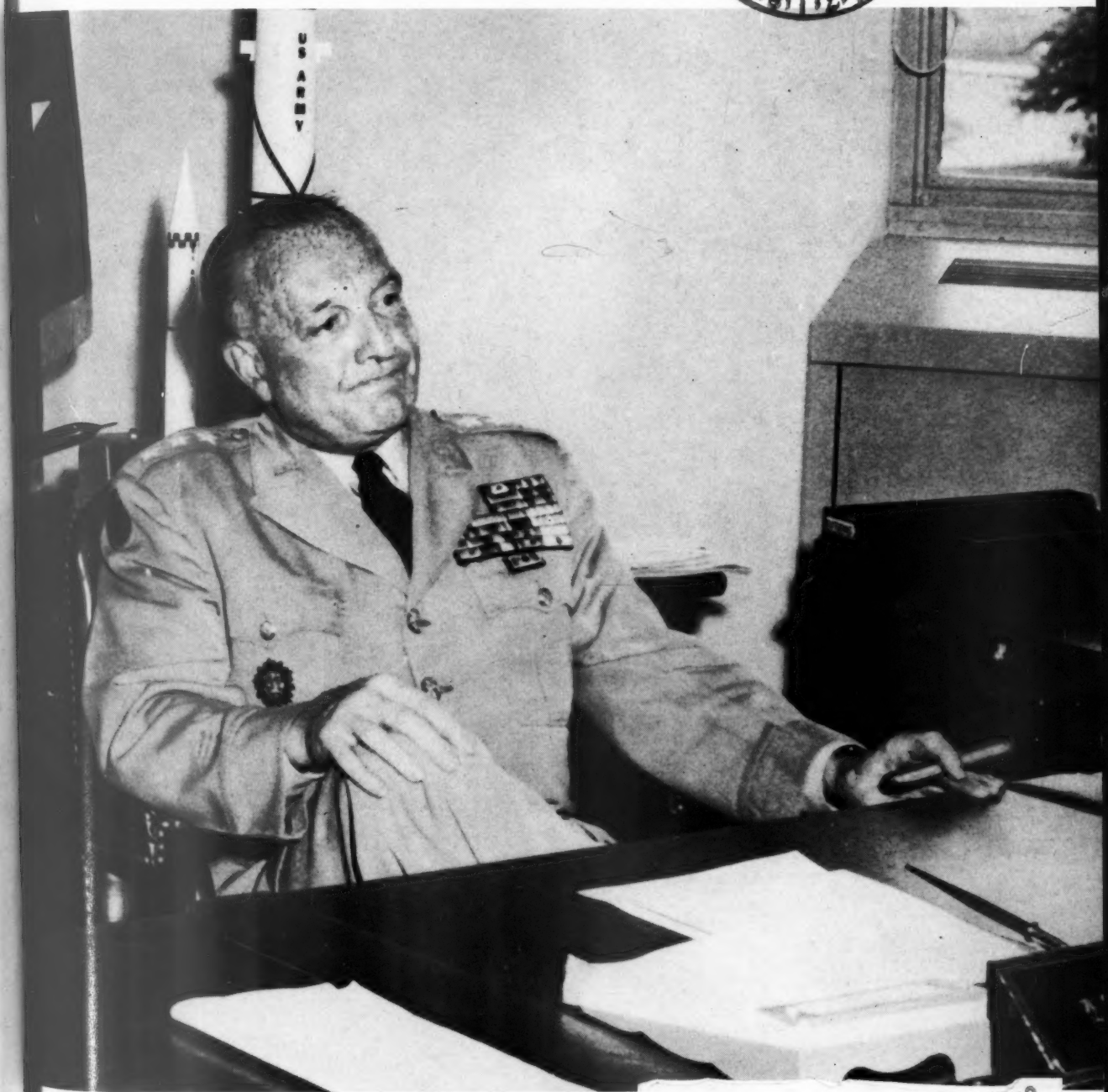
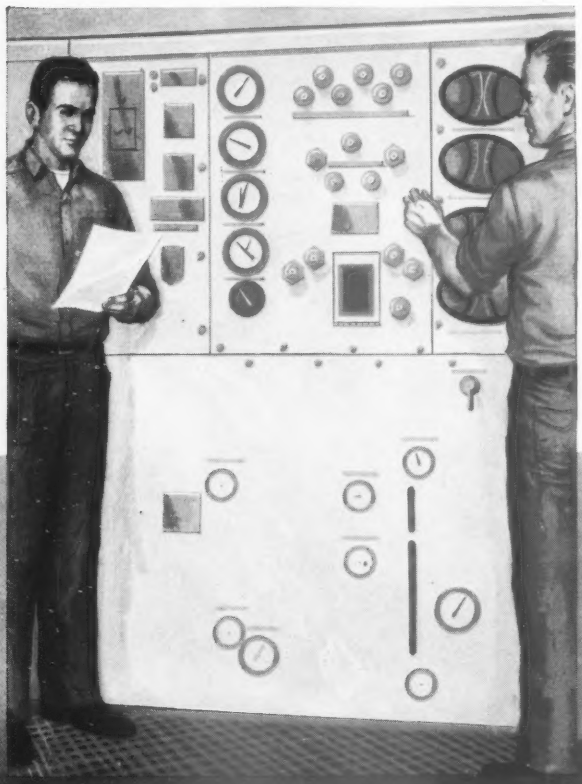


Army R&D Chief Trudeau . . . .

New Organization, New Goals . . .

SILENTLY SERVING NAVY'S POLARIS SUBS

Girdler scrubbers continuously pull atmospheric CO_2 out of the air



Atomic-powered Polaris Subs go around the world without surfacing — and can stay "hidden" for months at a time. The Sub's long-ranging endurance is only possible when — pound for pound — every piece of equipment aboard performs with maximum efficiency. Dependability is a must!

Girdler has been selected to build CO_2 Removal Units for most of the submarines in the current Polaris program. Two Girdler units are usually installed on each submarine, although one is sufficient to handle the load by itself. These units are easy to maintain, and require only 5 minutes of operator attention per hour.

The CO_2 removed by the Girdler scrubber is pumped into sea water where it quickly dissolves leaving no tell-tale air bubbles. Girdler's research and development work has been an important factor in developing the Navy CO_2 removal unit.

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RELIABILITY...

every missile must count. A wasted firing due to a minor-part malfunction results in appalling losses in time and money. Combat condition failures are even more disastrous. Vitro Laboratories, under contract with the U. S. Navy Bureau of Ships, has developed advanced mathematical approaches to make reliability a predictable feature of design. Over a thirty month testing period predicted failures correlated strikingly with actual results. Tested equipment included radars, radar repeaters, radio transmitters and receivers, and radio terminal equipment. Reliability is another reason why Vitro is a leading name in systems engineering today.

Vitro

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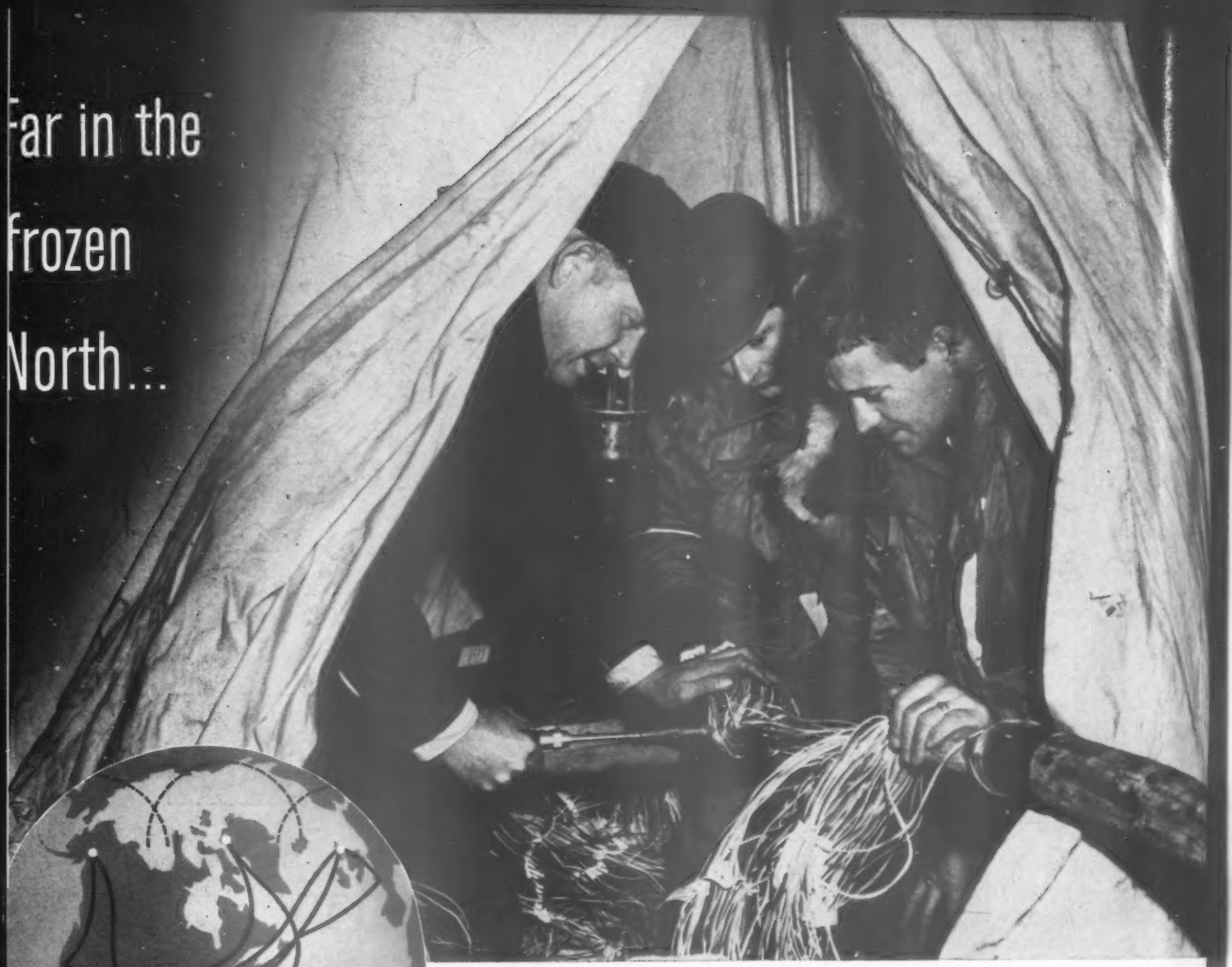
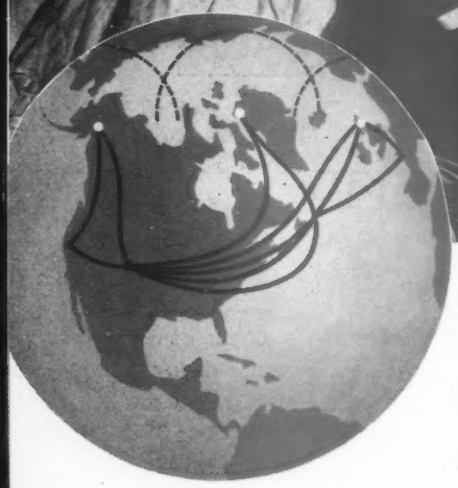
Far in the frozen North...





Bell Telephone engineers are putting together the nervous system for BMEWS ...Ballistic Missile Early Warning System

The eyes of the U. S. Air Force BMEWS will be massive, far-seeing radars located in Alaska, Greenland and Great Britain. The brain is at the Continental Air Defense Center in Colorado Springs. Between the eyes and the brain there will be a vast network to provide instantaneous, highly reliable communications in the event of enemy missile attack.

The Bell System's manufacturing and supply unit, Western Electric, heads a team of 30 private firms and government agencies from three countries which is constructing this communications system.

Work is going ahead at full speed, right on schedule. All of the arts of long distance communications are being used to conquer the stern, hard-bitten terrain of BMEWS—line-of-sight and over-the-horizon radio, cables on land and under water.

Several forms of transmission are being employed. Newly designed high-speed data channels will feed information to the BMEWS computers. Voice and teletypewriter links will also be available.

One important reason the Bell System was given this assignment was its demonstrated capacity to handle such a challenging task. The resourcefulness and skill shown in this and other defense projects are significant assets contributing to our country's readiness.

BELL TELEPHONE SYSTEM

ARMED FORCES Management

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DECEMBER, 1960

Volume 7—No. 3

FEATURES

Army R&D: A Better Way To Do The Job 17

Army's new alignment for getting its research and development work done is one that will place the authorities and responsibilities in the same place, and one that should do much to speed the development of new Army weapons. The new set up represents a concerted attack on lead time, and a set of changes that will put the Army in much better shape to get its job done.

(Cover picture: U.S. Army photo)

Why ARDC is Placing the Accent on People 20

From ARDC Commander Bernard Schriever on down the line, Air Research and Development Command is bending over backwards to see that it has the best possible people on hand to get its researching done. This story tells why the program was started, and what's being done.

Missiles, Money and Microfilm 23

What Redstone Arsenal is doing to make sure that its engineers have the information they want—when they want it.

Pentagon Profile: This Month—Lt. Gen. Arthur G. Trudeau 28

Chief of Army Research and Development: "We think there are better ways."

Industrial Funding: Will it Work in Wartime? 35

The final test of any military management technique is whether it will do its job under the strain of war. This article raises some pertinent questions about industrial funding in this light.

The Ninth of Fourteen Erroneous Postulates 48

An organization is formed by delegation and operated by supervision.

DEPARTMENTS

Editorial	9	Association Newsletter	39	Your Investment Future	49
Washington Background	13	Research Rundown	41	Advertisers' Index	50
		Procurement Trends	45		

FEATURED NEXT MONTH

The Good Manager: A New Approach . . . How the Budget Works . . . Why Missile Ranges are Changing Their Approach.

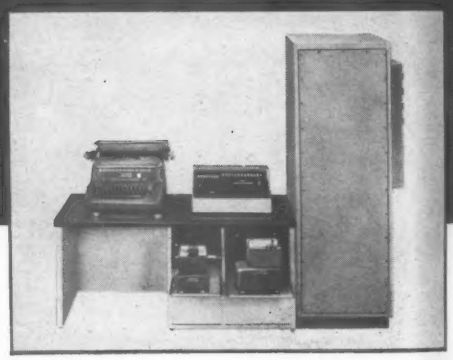
READY FOR USAF

The Military Air Transport Service will get the new extended-range C-130E Hercules fast, because the basic design is already proved. The long-range Hercules goes into production at once to meet the immediate need for a modern strategic airlift force.

The ne long-range version of the versatile Lockheed C-130 Hercules gives the Air Force a strategic airlifte that can carry a 20,000 pound payload for more than 4,000 miles at average speeds up to 300 kn ts. Or 2,900 miles with a whopping 35,000 pound cargo. The big propjet C-130E meets these r quirements for airlift operation: straight-in end loading; truck-bed height cargo floor; air-condit ned, pressurized cargo compartment; and the ability to lift, land, or airdrop heavy, bulky pieces f freight.

LOCKHEED GEORGIA

WORLD HEADQUARTERS FOR AIRLIFTERS AND CARGOLOADERS



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The Tactical FIELDATA Computer Designed and Built by Philco

Basicpac is a rugged, mobile, solid state data processing system, being developed by Philco in conjunction with the U.S. Army Signal Corps for use in forward area tactical situations.

This unique development is directed towards an integrated automatic data processing system for the entire field army . . . in logistics, administration, intelligence, command support and fire support. Basicpac can be transported and operated in an S-109 shelter mounted on a 2½-ton truck or operated from a fixed installation.

In the development of Basicpac, Philco made full use of the most advanced techniques in solid state circuitry and semiconductor components. The goal is a compact general purpose data processing system that will be rugged, flexible, reliable, easy to operate and maintain under the severe conditions of field operation.

Basicpac is capable of handling such diverse applications as weapon-target allocation, converting raw surveillance and intelligence data into effective decision making forms and providing logistics and other administrative support activities in combat.

Basicpac will be delivered in December to the U.S. Army Signal Research and Development Laboratory for final acceptance testing.

Basicpac represents still another major achievement by Philco that will help to make the U.S. Armed Forces the most efficient and capable fighting group in the world today.

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The *Man* in Management

BEING against personnel mediocrity is, in the Pentagon, about like being against poverty. Everybody, but *everybody,* is. So much so, that, assembled in one place, the documents on the need to attract and hold top calibre people on to the military payroll would make several life-size, paper bound copies of the Empire State building.

The curse of progress is, unfortunately, that with every hot puff of debate, the highly placed bosses (who might do something) set off, like a Spartacus horde, in rabbling rhetorical rondos—which stir up a lot of emotions and usually accomplish far less. Which is precisely the point: there is an awful lot of lip flapping about military personnel problems and very little doing.

Even though the expert personnel administrators say that uniform personnel policies are a must if the trend to joint military operations is to have reasonable chance of full success;

Even though the weapon systems managers are saying, more and more lately, that the lack of trained personnel is their biggest problem;

Even though Defense, which will continue to lead the nation's major new development efforts into the far foreseeable future (and will need top men to do the leading) remains low on the job preference list of college graduates;

Even though experienced electronic computer people continue to refuse government employ, (as do others) in spite of pay scales being highly preferable to industry's offerings;

Even though top military executives rarely miss an opportunity to emphasize the Man in management, that "people are the most precious resource we have to do our job." They just as rarely fail to point out how amazing it is that there are such highly talented people working in the field of national defense when it wouldn't be amazing at all—if personnel policies and practices were as sound as they should be made.

AND, MOST DISTURBING—to make jobs attractive actually would cost impressive dollars less than we pour down the rat hole each year finding and training replacements, who in turn average about six months productive work and haul out.

Nor can too much of this be blamed on the allegedly cobwebbed, dogmatic tardiness of the military itself. Generally, their recommendations have been trenchantly outlined—and too often just as brutally compromised. (Example: the Cordiner report.)

Now the tongue waggers are getting another chance to get up off their hands. Outlined elsewhere in this issue is Air Force General Bernard Schriever's "Accent on People." Rarely, if ever, has any military outfit gone to such length to find out what's wrong with the family, where it is weak and what it needs to get stronger. In effect, all of ARDC is in the act. (It is, in fact, a study all military personnel officers would benefit by analyzing.)

And unlike many like-seeming efforts before, this one obviously means business—control charts, milestones, progress reports, top management running the show and all the rest.

Such blue chip Capitol Hill names as Goldwater, Mahon and Stennis have voiced an interest. But interest in the People problem has been voiced before. And will be again. Personnel is the most over-legislated, legalistic mish-mosh the Pentagon fights. And no solid effort will ever develop effectively in the "Accent on People" without strong Congressional backing.

The pertinent question now: does Congress help the ARDC family obtain what they need? Or do the boys on the Hill pompously purse their collective lips, and resignedly conclude, as they do too often now, that "the personnel problem is just too big" to support anything other than fragmented attention?

Bill Borklund

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HELP MAKE IT POSSIBLE

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The sure hand of AE in radio network control

AE has had a hand in the development of many specialized communications control systems for the armed forces.

For instance, dial-controlled intercommunication network for the U. S. Navy that permits the automatic selection of any one of 45 radio channels from as many as 60 remote points aboard ship. Communications can be restricted to conference circuits or trunked to the ship's public address system.

Switching of this type is a logical extension of AE's 70 years of experience in the design of intricate circuit-routing systems for automatic telephone exchanges.

If you have a tough project in communications or control, AE can assist in the design, and supply you with basic components or complete control packages.

For more information on our special capabilities, write or phone (Fillmore 5-7111) the Manager, Government Service Division, Automatic Electric Sales Corporation, Northlake, Illinois.

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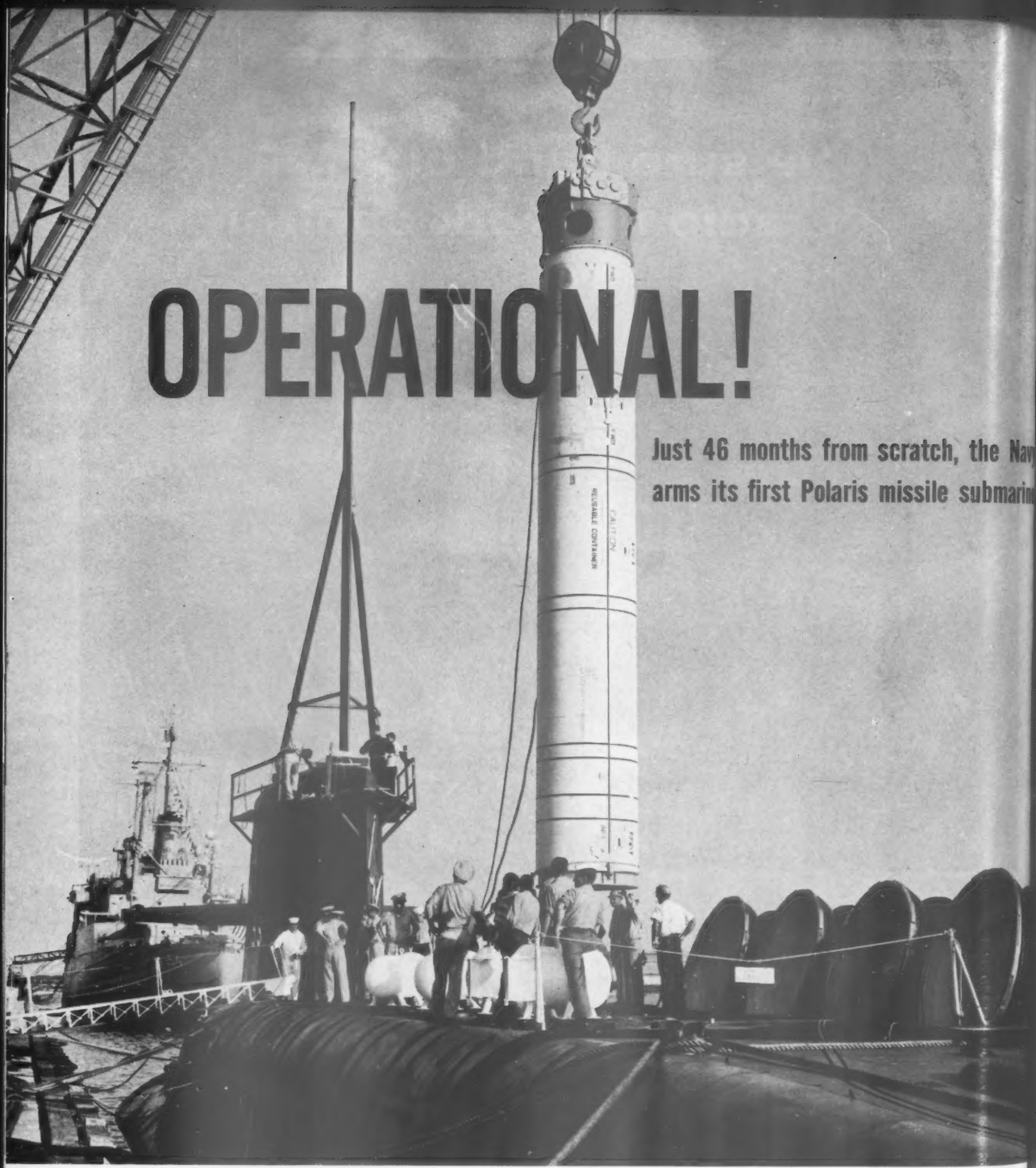


The Navy's Fleet Ballistic Missile weapon system is now operational. Somewhere in the seas that cover three-fourths of the earth the USS George Washington is on station, armed with 16 Polaris missiles. Thus ends a race against time; thus begins a new hope for peace. Lockheed, prime contractor and missile system manager, hails Aerojet-General, General Electric, Westinghouse, and the thousands of associated contractors, large and small, who helped bring the Polaris missile to operational status.

LOCKHEED

MISSILES & SPACE DIVISION · SUNNYVALE, CALIFORNIA

Washington Background

Site Snag On Titan?

Titan missile site construction has reached the same critical time span today that Atlas faced some months ago, i. e. to keep site activation moving now will require mostly highly specialized labor skills.

Hassles between these high-skill unions and contractors is one of the big reasons Atlas program sagged. High Defense officials have been doing everything they can to keep unions and contractors compatible. ("Everything has amounted to basically the buyer telling the seller why Titan is important.) Concern now: "Did the sales pitch take?"

One indication that it might have: following a "most genial" meeting of Defense and union leaders, union leaders asked for much of the material that had been covered by the Pentagon to pass along to the field.

What the "New Broom" Will Mean

Avowed intention of President-elect Kennedy to overhaul the Pentagon appears fairly high on the new year's priority list. In-house reform should come first, with changes needing Congressional approval to follow.

Key to what will happen will be provided by the study group under Missouri Democrat Stuart Symington, and the report that it comes up with.

Two factors that will have definite bearing on any meaningful change: (1) major —and simmering—groups within the Pentagon both for and against a so-called "single service," and (2) deterrence vs. counterforce advocates. Both are simply waiting for the right time to make their views emphatically public, both could easily use the forthcoming organizational shakeup as a springboard.

Carrier Cut Possible

Navy needs more money beyond its current budget—perhaps in the form of a supplemental—to keep all three of its carriers in the Mediterannean.

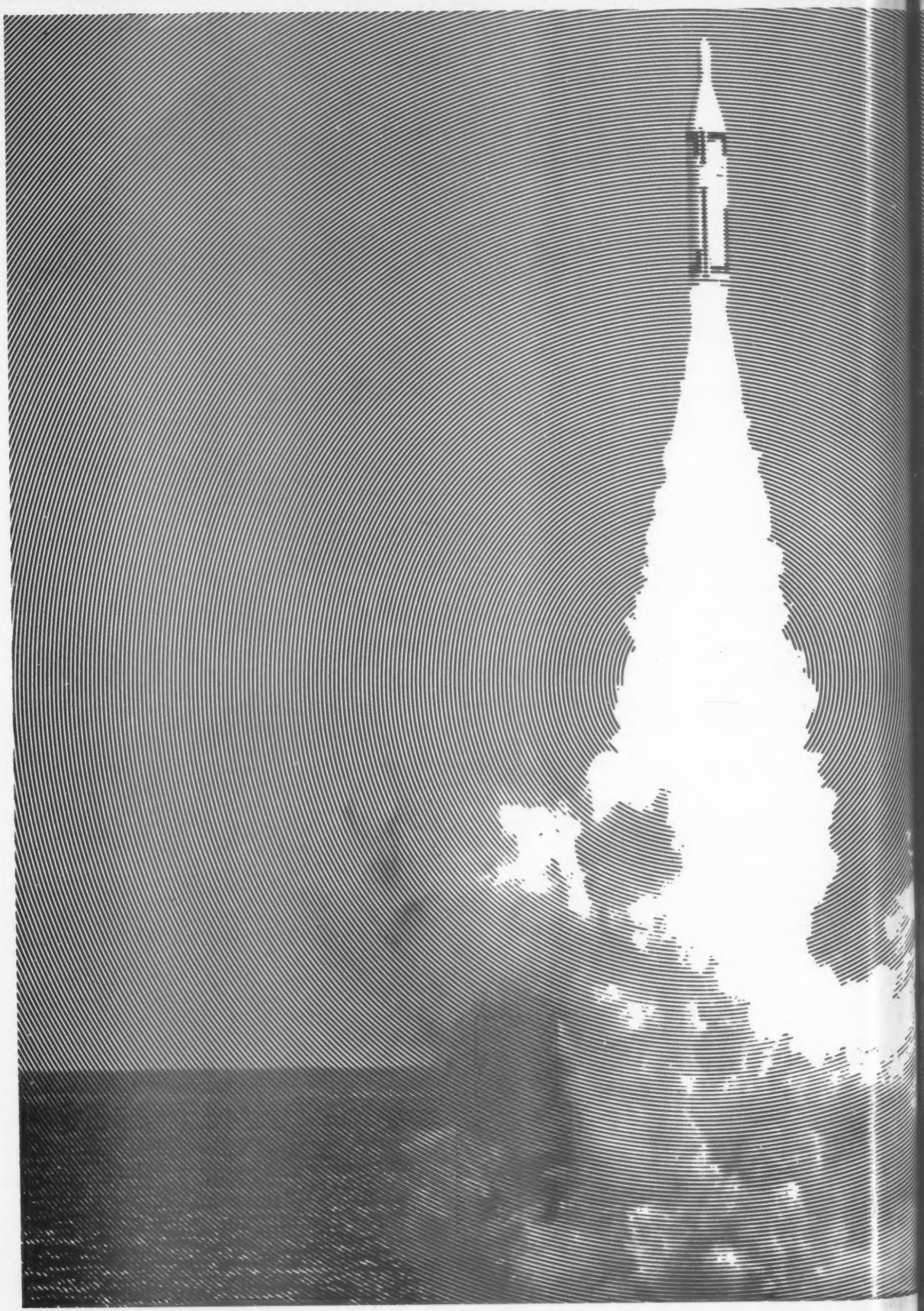
Although it was told to operate all of its carriers out-of-pocket, this look to Navy planners and budgeteers as more and more of an impossibility. The problem Navy faces was pointed out—in a slightly different light—by CNO Adm. Arleigh Burke, who told Congress that essentially the same thing would happen if a new carrier keel weren't laid down this year.

NATO, Pershing Polaris and Minuteman

Current sideline commentary on whether Minuteman, Polaris, or Pershing would best fill NATO nations' needs for a land-based IRBM amounts to not much more than a tempest in a teapot, if looked at logically.

Pershing was originally developed for land operations, and although it lacks the range of Minuteman, it makes up for this with a high degree of mobility.

Polaris has the range needed, and is rapidly approaching off-the-shelf status. Most likely result: compromise, with Pershing ground support equipment rolled under a Polaris or near-Polaris type missile.



Three years ago, the U.S. Navy handed American scientific and industrial leaders a formidable task. Problem: To develop and build a submarine-launched, intermediate-range ballistic missile with extreme accuracy and dependability.

Hundreds of organizations over the land pooled their talents and resources—under the direction of the Special Projects Office of the Navy.

The result: Polaris—today one of the world's most potent defense weapons. A unique marriage of space and sea power and a unique marriage of scientific and industrial ingenuity.

The Lockheed-built Polaris Missile has demonstrated accuracy in a great number of test firings using the guidance system designed by the MIT Instrumentation Laboratories.

Hughes initially contributed to the success of these firings as one of the suppliers of the electronics for the guidance system produced by the General Electric Company.

Hughes is today a prime contractor for production of complete Polaris guidance systems. These systems, incorporating Minneapolis-Honeywell produced inertial platforms, are now being built at the Hughes El Segundo plant.

The Polaris Missile is a major factor in the Free World's effort to maintain the peace. Patrolling deep beneath the seas, the Polaris Missile System will be a mighty, but silent force for freedom.

VIDEOSONIC* *assembly techniques, developed by Hughes manufacturing engineers, are the most important advance in production line flow since the standard assembly track. Used to build Hughes Polaris guidance systems, these techniques regularize flow, maintain reliability and reduce worker fatigue.*

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CREATIVE ELECTRONICS FOR DEFENSE

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Revolutionary RCA Magnetic Video Tape Recorder to Speed Navigation Training of Submariners

Aboard the nuclear submarine Sea Dragon, the first undersea magnetic video tape recorder will record and store data on under-the-ice characteristics from externally installed TV cameras. Upon return to base the recorded information will be displayed for the benefit of undersea service trainees.

The RCA undersea recorder is a marvel of compact design (dimensions 20" x 20" x 100"). It nestles in a torpedo rack, and represents a 60% space reduction over existing video tape equipment.

Among the exclusive RCA developments are: the now famous "Tiros" satellite recorder; a radar system designed to take the first pictures of a nose cone re-entry vehicle; a unique tape cartridge completely adaptable to any size recorder. For literature describing new RCA defense and commercial products developments, write Defense Electronic Products, Radio Corporation of America, Camden, N. J.

Out of today's defense needs...tomorrow's electronic advances

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Army Research And Development

A Better Way To Do The Job

The prettiest organization chart in the world won't solve anybody's R&D problems, but sensible organization can make the job easier. With this in mind, Army has taken the following steps towards a better organization . . .

by Col. Jackson E. Shirley
Office of the Chief of Research and Development

VITAL to the Army's efforts to insure accomplishment of the national objectives in the future is a research and development program that will produce the weapon systems and materiel needed to assure dynamic, vigorous reaction to any aggression.

Army has had a research and development (R&D) organization since 1924. But it has not been a static organization. Research and development in the Army has changed through the years much as breakthroughs occur in basic research—by spurts and jumps.

Generally, reviews of R&D organizations and their functioning have acted as the catalytic agent for the forward leaps. George H. Roderick, Assistant Secretary of the Army (Financial Management) was named chairman of the recent board appointed by the Secretary of the Army ". . . to conduct a study to determine the adequacy of the Army's present R&D organization and philosophy of operations and to make such recommendations as appear to enhance the effectiveness and capability of the Army's R&D program . . ." Before embarking into a resumé of the study compiled by the Roderick Board, a cursory review of Army's R&D organization is in order.

Although Army has three Assistant Secretaries—the maximum by law—a Director of Research and Development has been established at this level to assist Secretary of the Army in R&D matters. The present director, Richard S. Morse, directs overall Army R&D through functional policy supervision of broad policies of the Secretary.

Secretary of the Army formed the Army Scientific Advisory Panel to aid him in overall research and development. This panel is not in the command or supervisory structure. Its membership of eminently qualified scientific and industrial personnel is appointed by Secretary of the Army.

The panel, with about sixty members, works in subpanels concerned with particular fields. These subpanels work closely with both the Director of R&D and the Chief of R&D by helping to develop R&D policies and programs.

The Chief of R&D is at the Deputy Chief of Staff level and answers directly to the Army Chief of Staff. The Chief of R&D is responsible for planning, coordinating and supervising all matters pertaining to R&D. Close coordination required on R&D between all staff elements is handled at this level.

Below Department of the Army level, the vast research and development program is run by action agencies of the R&D organization. Two major agencies are the technical services—the developers—and the Continental Army Command—the users.

Each technical service head is charged with the complete life cycle of a product—from research, to procurement, to setting maintenance standards.

USCONARC is functionally organized for R&D activities in two distinct areas—Combat Developments and Materiel Developments. Combat Developments deals with new tactical organizations, new tactics and use of and requirement for new materiel.

Materiel Developments provides the user's definition of equipment (military characteristics), monitors new equipment developments and finally tests this equipment with troops under field conditions. Logically, the two areas complement and assist each other.

The organization of the Office of the Chief of R&D is set up with the directorates and divisions necessary to carry on the diversified functions of the Chief of R&D. Of particular note is the level where management appears. The Director of Plans and Management is the overall "professional" manager in OCRD.

The Research Directorate, known as Army Research Office, has the vast research area under its supervision. Today, this covers almost 2600 research tasks spread across 16 major and 74 sub-fields of scientific endeavor.

The final two directorates—Special Weapons and Developments—work primarily with materiel. It is in the divisions of these directorates that the myriad of Army equipment under development is monitored.

With these paragraphs as backdrop, a further look at the work of the Roderick Board will show Army's efforts to insure an R&D organization that is efficient, economical and productive.

The board approached the problem by examining the significant factors affecting the Army's research and development effort.

These factors are: organization; policies, procedures and practices; financial management; personnel management; and the associated philosophy of operation. Problems were revealed in most cases by indications of a need for more emphasis on R&D activities; more definitive responsibilities and authority; improved coordination of planning at the Army Staff level; and better management techniques.

As an adjunct, the research and development work in four large indus-

trial corporations was examined. The aim: relating R&D practices in industry to those of the Army where applicable.

The study showed differences between each firm, but an overall degree of uniformity on R&D organization was plain. Further, a more uniformity on philosophy of R&D operations was reflected in:

—Setting up R&D as a "line" function equal in status to manufacturing, sales and finance;

—Delegation of authority and responsibility as shown by central policy and program guidance and decentralized program execution;

—A research program guided by return on investment;

—Clear lines of authority and control within operating companies and departments and the higher levels of management;

—Continuity of service of key scientific and management personnel.

There is also standardization of procedures and practices relating to R&D within these firms, characterized by:

—Control and provision of guidance on a relatively broad basis by higher levels of management;

—Stability of R&D effort and funding levels;

—Extensive coordination, liaison and information exchange both formally and informally;

—Recognized duplication of research effort and controlled competition among operating companies and departments.

Using all these industrial practices in Army R&D is affected by fundamental differences between private and government agencies. These differences are evident on such matters as the: Aims of Army R&D; diversification, scope and complexity of Army R&D; funding; and controls on the Army R&D program by external agencies.

Many industrial practices and philosophies have been used by the Army for some time. These include: Treating R&D as a "line" function in the technical service; technical service organization on a commodity basis; and a program guided by potential military value of research results.

Following industrial practices of true delegation of authority and responsibility and providing guidance and control on a broad basis at higher levels of management, although desirable, is limited by differences previously cited.

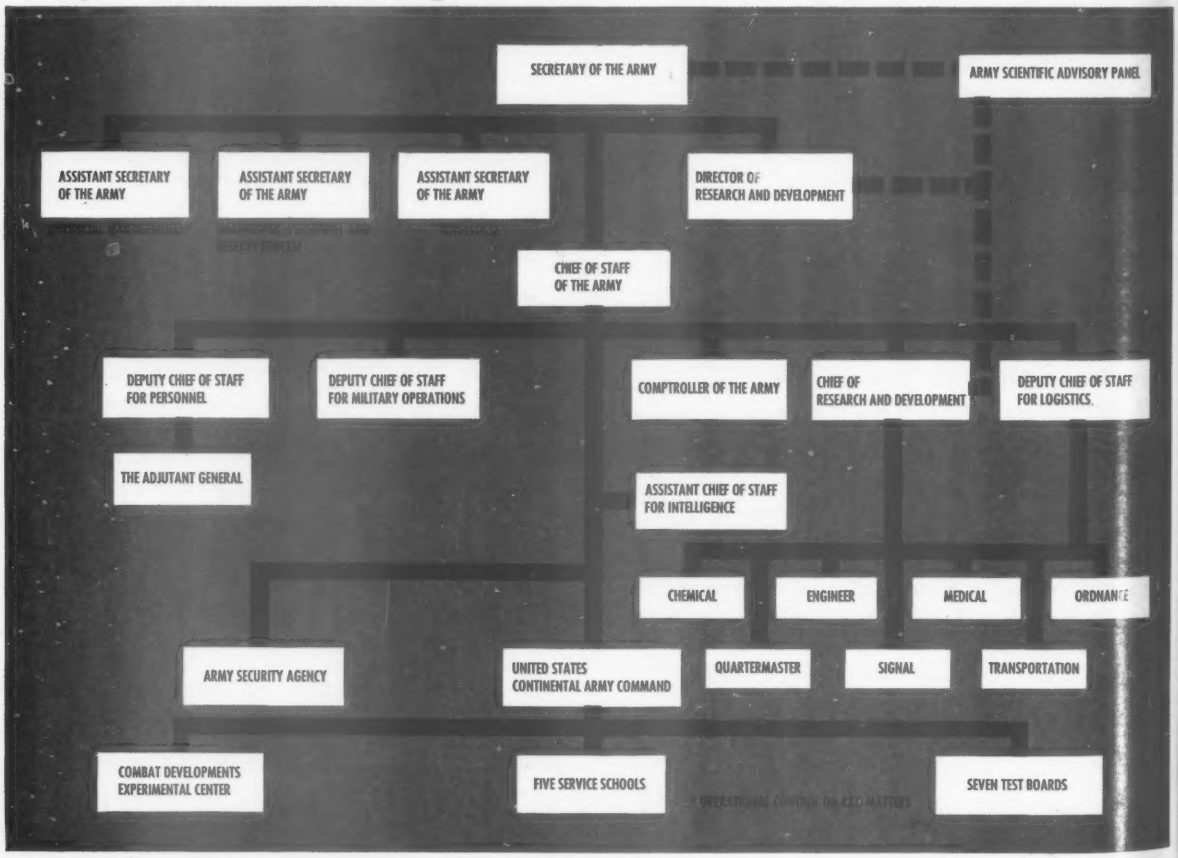
But, modified use of certain industrial practices in Army is desirable and feasible. These are:

1. Greater continuity of service for military R&D personnel.
2. Relative stability of R&D effort and funding level.
3. Recognized research duplication and controlled competition.
4. Distinct authority and control lines.

This comparison with industry merely established a framework for further investigation. The many facets of R&D were studied primarily against the development process. But end products, not the development process, are a concrete measure of R&D effectiveness.

Before going on it might be well to consider the effort of Army R&D. Significant firsts and contributions are

Army's New R&D Set up . . .



From Womb to Boom . . .

CHAIN-of-progression following an R&D idea. The four most important steps.

impressive—chlorination of water, irradiation treatment of floods, first recovery of a nose cone from space and many more.

The implementing directive of the Secretary of the Army, following the Roderick Board's recommendations, reflects action deemed necessary to insure continued success of Army R&D.

The Chief of R&D now controls R&D activities of the tech services through a line of responsibility and authority parelleling that of Deputy Chief of Staff for Logistics on logistics. This significant feature of operational control was previously lacking.

Chief of R&D now has directive authority in all matters primarily concerned with research, development, test and engineering. This includes programs, facilities used primarily for these activities, funds and manpower assigned to these functions.

Within this framework Army's R&D mission is accomplished. Channels through Heads of the Technical Services to their R&D chiefs and field installations engaged in this work are being set up to insure effective response to program and policy determinations of the Chief of R&D.

Staff responsibility of the Chief of R&D was restated and amplified. Under policies of the Director of R&D, here are Chief of R&D's responsibilities:

—Planning, coordinating, directing and supervising all Army research, development, test and evaluation including all controls over R&D policies, funds, and manpower (within over-all Department of the Army policies) which are needed to discharge this responsibility.

—RDT&E plans and programs.

—RDT&E projects and tasks and related priorities.

—Military characteristics of new items.

—Qualitative materiel requirements.

—Combat and technical intelligence regarding research and development.

—The ABC Army Standardization Program, the Mutual Weapons Development Program, and R&D aspects of NATO Standardization.

—Forming and supervising these portions of the annual military budget which pertain to the research and development program, within the over-all budget policies developed by the Comptroller of the Army.

Further, under over-all Army policies, directs and controls the RDT&E effort of technical staffs and services in all matters covered above, and also

—Assigns research and development responsibilities and undertakings.

—Designates research and development objectives.

—Exercises manpower control over military and civilian personnel spaces of the technical services engaged in research and development work.

—Determines distribution and use of RDT&E funds.

To add further emphasis to the R&D program, other Army staff members are expanding their activities and capabilities in the fields of combat developments and long-range planning in regard to R&D efforts.

At the top R&D echelon, effort aims towards placing Army's over-all long-range operational concepts and R&D objectives before the Director of Defense Research and Engineering.

Ultimate goal here is to advance attainment of national goals through coordination at the highest research and development level.

Also for greater emphasis in keeping the scientific and industrial community abreast of Army R&D, an 8-volume publication, *The U.S. Army Research and Development Problems Guide*, has been prepared.

This publication, prepared under the direction of the Chief of R&D, presents over 1000 Army R&D problem areas that must be solved in the next few years.

To date, over 7000 volumes have been distributed in answer to industry requests.

To keep ahead of exploding technology and science it was clear that planning for all aspects of R&D would have to be projected into the future.

This planning would have to reflect future thinking of all Army Staff agencies. Also, effort is being made to give better direction to technical intelligence aims.

The scientific community, with intelligence of this type, can forecast future technological achievements. This will greatly assist long-range R&D thinking and planning.

Realistic advanced planning for future manpower needs is being projected by coordinating personnel needs throughout the Army Staff.

A major step in development work is setting Military Characteristics. An MC is the user's definitive, detailed statement of requirements for an item to satisfy a materiel need. To insure that MC's receive prompt approval by Chief of R&D, CONARC will now insure coordination of MC's with the technical services prior to submission to Chief of R&D.

Manpower, so essential to the R&D mission, has previously been beyond the management realm of the Chief of R&D. But Chief of R&D now controls military and civilian R&D spaces in the technical services.

Thus, spaces for civilian personnel in R&D positions at the tech service

(*Continued on page* 31)

Why ARDC Is Placing the 'Accent on People'

Air Research and Development Command is facing a personnel situation that borders on being critical. This is the problem, and what is being done to solve it . . .

by James Lewis

TOP DEFENSE managers (when they think about the problem at all) are certain (even without solid statistics to back them up) that key personnel turnover is one of the most deadening drains on defense resources that exists.

At the same time, any attack on turnover has been a "bits and pieces" affair. With only occasional exceptions, there has been much lip-flapping and tongue-wagging—and little coordinated action.

Largely because of this, efforts of service personnel offices have been, as one officer put it, "like trying to carry bread dough in a hair net. When the stuff starts squeezing out on one side, you push it back in and it pops out on the other."

One prime example of this is the personnel problem facing Air Forces's Air Research and Development Command. With the build-up for World War II and Korea R&D officers in the 10-to-20 year fields were plentiful. But a shortage developed between these and the four year non-career officers in the Air Force.

The result: a plentitude of older research officers, lots of short timers in the youngest grades, and a hole in the middle. What it means: ARDC's scientific and engineering force is seriously short on replenishment of career-type officers, and the career force gets older and older.

Filling this gap has become a project for concentrated effort at ARDC, starting at the top with Commander Lt. Gen. B. A. Schriever, and running right down the line to the lowliest airmen and civilians in ARDC.

As far back as five years ago, ARDC knew it had a personnel problem, but not much was being done to correct it. The advent of more advanced weapon systems and the technological explosions of the last fifteen years has brought about increasing demands by both military and industry for more highly-trained scientists and engineers.

As one ARDC officer put it, "we've advanced faster technologically than we thought possible five years ago. The battle of the drawing boards has become one of major significance in the Air Force as well as in industry. We're no longer competing inter-service, but with outside industry. We have to bring our standards up to theirs in order to compete with them for top science and engineering personnel."

Higher Standards

Raising the standards (concentrating on career enhancements) for the new science and engineering officers is precisely what Schriever had in mind when he initiated his "Accent on People" program in April, 1960.

He sent personal telegrams out to all ARDC Commanders in which he said: "I have directed that a complete review be made of the Command Personnel Program for the purpose of making changes which are desirable to achieve the greatest possible utilization, effectiveness, retention and morals of both military and civilians in ARDC."

The biggest problem now is holding on to the four-year man who comes into the Air Force, fullfills his military obligation, and returns to a civilian job—doing basically the same work as he was in the Air Force.

It was clear that Schriever meant business in his new program when he directed the establishment of the AFROTC R&D Lieutenants *ad hoc Committee*. Twenty-two first and second Lieutenants, all holding degrees, (3 Ph. D.'s, 9 Master's, 10 B.S.'s) were called to ARDC Headquarters in October this year.

The aim: to tell Schriever how more scientific-minded young officers could be induced to remain on the blue-suit team. These "worm's eye view" recommendations are now in Schriever's office for consideration.

Where many new programs get off to a strong start and then lose momentum, Schriever has insured that this doesn't happen with his Accent on People program. Since it began, Schriever has regraded it as a pet project, keeps informed of any changes with a Personnel Management Chart that shows the progress being made on the projects of the Accent on People program. (See Box)

When the program first got underway, Division and Center Commanders were directed to nominate one mission oriented officer and one mission oriented civilian for membership on a Personnel Review Committee.

This committee, headed by Col. Frank J. Seiler, was to recommend to Schriever by June 1960 changes desirable to achieve the greatest possible use, effectiveness, retention, and morale of both military and civilians in ARDC.

(continued on page 22)

The Programs in the Mill

Build Prestige . . .

Civilian Classification "P" System—Would aid in the quick identification of scientific, engineering, and professional personnel.

Action: Project is still under study. Has slipped on progress chart.

Prefix "R"—Will provide a means for identifying, controlling and assuring optimum use of trained, super-skilled airmen qualified for research, development and test work. An R will be placed in front of the basic AFSC.

Action: Awaiting approval by Headquarters USAF.

Civilian Employee Education at USAF Institute of Technology—Recommends program to let 25 civilians attend AFIT each year.

Action: Letter outlining proposal being sent to Headquarters USAF.

Minimum-Maximum Tour—To evaluate current time in place policies and develop a more realistic approach to the controlled tour policy.

Action: Headquarters USAF is working with Headquarters ARDC on this project. It is still under study and has slipped on the chart due to requirements for further study and coordination.

ARDC-Military/Civilian Structure—This project proposes to define military/civilian position and relationship in ARDC and then stabilize them.

Action: Target date for the establishment of control procedures is November 1960.

Better Pay . . .

Flying (Accrual) Pay and Technical Competence Pay—insuring a flyer that he will get a part (proposal now is 5% of total rated service) of his flight pay if removed from flying status for convenience of the government. Tech Comp Pay will let the service provide extra compensation to personnel with highly developed technical skills.

Action: Flying Pay is now in legislative channels. Tech Comp Pay is under study by Director of Personnel Plans and Policies, Headquarters USAF.

Officer Promotion—Set criteria to identify the truly outstanding officer and develop a proposal for more rapid advancement of these individuals.

Action: Plan under development and problem is quite complicated. Will be a while in the making, although one of the most important items on chart.

Keeping the Best . . .

Project Recall—Identifying those experienced science and engineering officers who have been released from active duty, and solicit selected categories for voluntary recall to active duty.

Action: Records of 2,779 reservists were screened—1,188 identified for further screening. Air Staff now reviewing volunteer applicants.

Change AFROTC Basic Philosophy—Change the philosophy to producing career motivated officers trained for active duty instead of training for the inactive reserve forces. Possibly provide economic assistance and advanced education (on a competitive basis) to students.

Action: Placed in Standby Status. Total ROTC program is under study by Headquarters, USAF.

AFROTC (Force-in-Being)—Reorient congressional thinking to change the concept of AFROTC to force-in-being rather than a reserve force. (Closely connected with above plan.)

Action: Placed in Standby Status pending action on the Change AFROTC Philosophy item.

Recruitment Advertising in Trade Journals—After a thorough study of appropriate media, types of advertising, and best methods of answering ads, a 12-month ad program will be set up.

Action: Target date for the study is January 1961 with the starting date for a nationwide advertising campaign slated for July 1961.

Retention of Date of Separation Officers—Deals primarily with retaining AFROTC graduate Date of Separation (DOS) type officers—in the past as low as 4% per year. The goal: raise the retention rate to 25% by December 1961.

Action: A committee of Lieutenants has discussed the overall problem and submitted recommendations to Commander, ARDC.

20-10 Program—Is designed to identify, well in advance, those officers who will be affected by Project 20-10, whom must be retained on active duty beyond 20 years and establish appropriate procedures for insuring their retention.

Action: Board of officers being appointed to review records of eligible officers.

Trimming Deadwood . . .

Sub-standard Personnel—Increase Civilian Probationary Period—Facilitate weeding out of substandard personnel in ARDC. Extend the probationary period from one to three years.

Action: Program is still being drawn up. If accepted, will need legislation.

Administrative Discharge Regulations—Purpose is to clear up certain regulations pertaining to administrative discharge of airmen. Foster their prompt application as needed.

Action: Regulations are presently being rewritten. ARDC JAG wrote six page opinion on the Air Force Regulations. Coordination is now being obtained.

Modification of Civilian Appeal Procedures—Since several cases have been lost due to procedural violations, a study is underway to find simpler, more easily followed procedures. These would be offered to Headquarters USAF and the Civil Service Commission if appropriate.

Action: Data is presently being compiled.

Field men asked such questions as: What's the problem? What are your frustrations? Your personnel analysis? What's the ARDC family like? Where is it strong and where is it weak in talent, education, or job skills?

To come up with the answers, inquiries were run and statistics gathered from personnel. In some cases, committee members became as expert in personnel matters as their own DCS/Personnel.

This report, upon completion, was broken down by the ARDC Personnel Staff into 46 "most important" items. These were then put into a Personnel Management Chart. Their progress could then be checked by those with the responsibility to carry them out.

Another aid being used by ARDC for the first time is an IBM 650 Computer at the Personnel Research Laboratory, Lackland AFB. It is the first known time that a computer has been used to attempt personnel planning.

The new method will give ARDC a means of forecasting personnel recruitment, retention, retirement, education specialties, etc. As one officer put it, this "is certainly better than the old head scratching, window gazing approach."

To effectively consider the 46 points of the new program, a set of ground rules were laid by Brig. Gen. John E. Dougherty, DCS/Personnel of ARDC, to delineate action authority. Those actions which can be handled with ARDC's approval authority are defined as "in-command." Those needing broader approval authority are defined as "requiring Air Staff support"—from USAF, DOD, Civil Service Commission, or legislative action.

Recommendations and programs that require Air Staff support relate to recall of science and engineering officers; pay, allowances, and classification; recruitment; retention; officer promotion; enhancement of prestige; and career control.

Of the 46 items on Schriever's chart, 16 have been completed—mostly "in-command." Of the 30 remaining, they either are under study, require USAF review, or are pending USAF, DOD, CSC, or legislative action.

The biggest headache confronting ARDC and the Accent on People program is compression of time. As one officer put it, "if these things aren't done soon, in 10 years there will be no hope. But we have a much better idea now of what the problems are—much more than six months ago. One thing is for sure, people are talking about it now and are conscious of it."

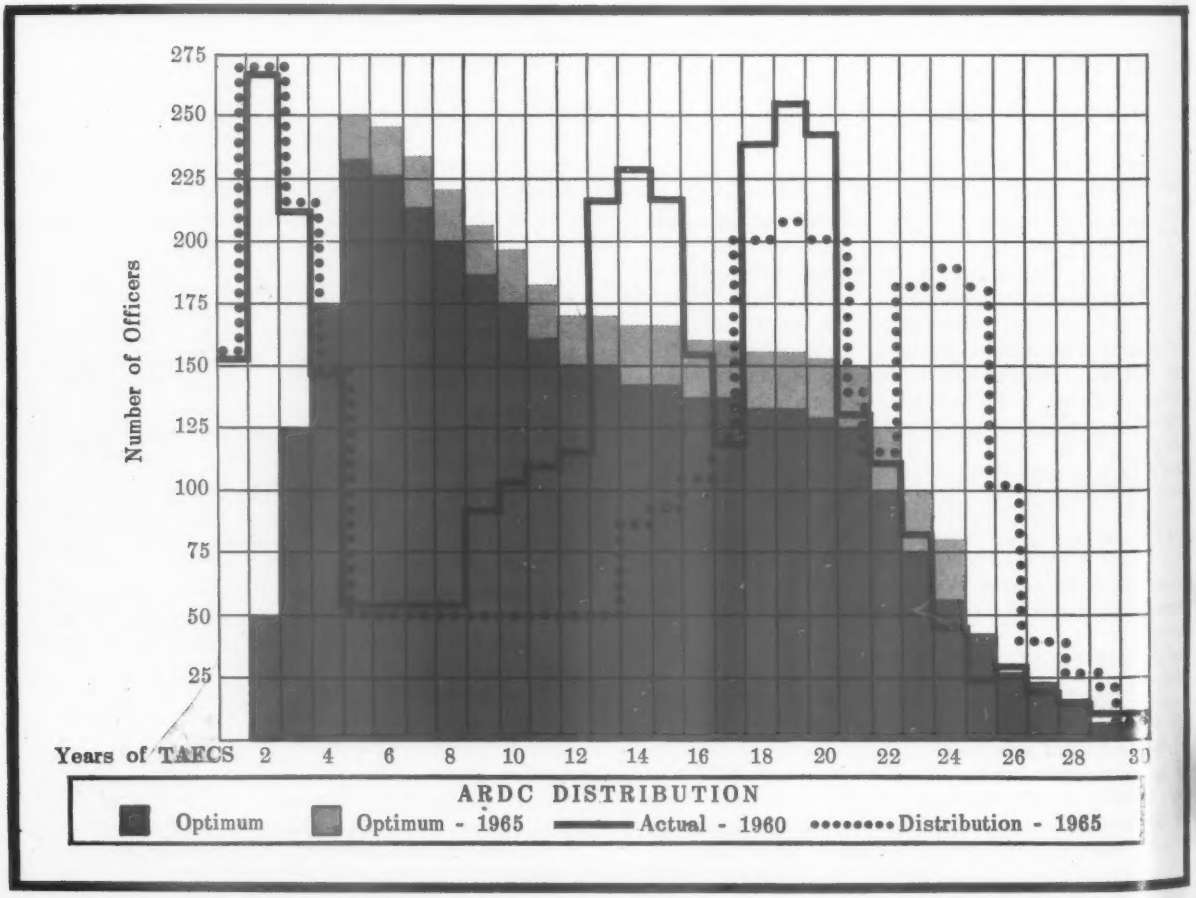
With some programs being tied up at the staff level and others at the Pentagon and legislative levels, completion dates are at best uncertain. Some have target dates as late as December 1961.

In carrying out Schriever's program, it isn't unusual for an ARDC officer to be wearing two and three hats. In the case of Brig. Gen. John E. Dougherty, seven or eight of the 46 projects are under his direct supervision.

The people connected with this program have and are still displaying enthusiasm and initiative that has been lacking in many personnel programs undertaken by various organizations in the Department of Defense.

One thing is certain: if major items of the Accent on People program are carried out and acted on by the upper echelons, the problem of filling the 4-to-10 year gap in ARDC will be well in hand in the next decade. ■

The ARDC Personnel Problem . . .



Missiles, Money and Microfilm

Pioneers in the space age, the men at Redstone Arsenal have their feet firmly on the ground when it comes to management. This is one technique that has eased the handling problems inevitable with over two-million documents to control.

IN THE PAST three years the U.S. Army Rocket and Guided Missile Agency, with headquarters at Redstone Arsenal, has grown to be one of the largest Defense Department users of microfilm mounted in aperture cards.

Currently their engineering documents section has an active file of over 850,000 drawings and related documents. A historic file holds over 1,500,000 drawings and documents, all on card-mounted microfilm.

Much of the equipment and many procedures are unique to ARGMA, evolving from specific Agency needs.

Prime contractors supplying parts and missile weapons can supply all engineering records on microfilm mounted in aperture cards—to ARGMA as well as depots and sub-contractors.

ARGMA is now equipped for instant, completely mechanical retrieval of any of its 1,500,000 drawings. Also, it can print out in virtually any form desired—paper-to-paper, card-to-paper, card-to-card and paper-to-card.

Because of strategically placed viewers and reader-printers throughout the Documentation Service Unit and the engineering section, concerned personnel can view enlarged microfilm drawings and, within seconds, obtain paper copies for future reference.

Future plans call for greater expansion of the mechanized engineering documentary filing system. Feasibility studies are now in the works on more system modifications to permit faster search of filed microfilm documents. Also under study is use of closed circuit television, to bring filed documents even faster to the engineer desiring them.

In the early 1950's, with the mushrooming Army missile program—during which numerous missiles with different objectives joined Army's arsenal—it was seen that the then current method of keeping vital engineering documentation necessary to the weapons would be outstripped.

ARGMA Engineering Documentation Center had to receive, check, record, store, reproduce and distribute documentation and relay data for each component of every missile system. Operating units couldn't work without proper up-to-date documentation for repairing, servicing and firing the missiles.

Engineers constantly used drawings as an aid to the number of missile systems designed. The procurement division of ARGMA needed quick access to diagrams, drawings and specifications to get needed parts from scores of manufacturers.

Saving money and time . . .

The documentation center started off in 1950 with a manual operation, using original drawings and blue prints. By 1954 it had become plain that manual operation just wouldn't work—some faster, less expensive system was urgently needed.

After two years of intense studies of mechanized processing, it was decided, in late 1956, that a combined microfilm aperture cards and electrical accounting machines would solve many of the problems.

During early 1957, two microfilm cameras were bought, minimum electrical accounting machines were installed, and ARGMA began converting to mechanical filing and retrieval.

During these early months one difficulty to be overcome was maintaining a complete, uninterrupted manual system while conversion took place. This meant that for several months two separate systems had to operate and both files be maintained.

The Beginning

At first, "hard copy" engineering drawings came to ARGMA from the scores of suppliers and contractors. Drawings were checked for accuracy and legibility, microfilmed on 35mm microfilm, and sent to a film processing contractor for developing and the duplicating. They were then returned to the Agency at Redstone.

Next, an EAM card with all information to control engineering drawings was key-punched and verified.

The punched card was then used to reproduce as many duplicate cards as necessary and then, with a semi-automatic mounter, film was cut and mounted in the punched card.

While the system still follows basically the same principal, because of increased volume, prime contractors and suppliers now submit engineering data already mounted in aperture cards.

ARGMA still receives hard copy documents from contractors whose work load does not justify filming, card punching and mounting equipment. ARGMA then films and provides EAM cards itself, as it does for those engineering documents and related data originating at the Agency.

The single great advantage under the microfilm system was that the EAM card, once verified, held a forever-accurate engineering drawing combination with all pertinent information, ready to be sorted into any desired sequence, reproduced, filed and retrieved.

Time savings are, of course, enormous.

Equally important are space savings. It is now possible to store 100,000 drawings in only 4 square feet of floor space.

Personnel savings are equally great; ARMA has reduced its clerical personnel by over 40% since mechanizing. Besides time, space and personnel, ARGMA has found substantial dollar savings with the new system.

Once microfilm was introduced for the engineering documents, copying was the next step—both engineering and procurement needed copies of all documents instantly available. The Agency thus set up the following basic methods of printing out any or all engineering information for agencies concerned:

Card to Paper: For those needing paper copies, ARGMA has an automatic electrostatic printer which prints the microfilmed image on either plain bond paper or reproducible paper at 20 ft. per minute. The machine can print from one to 400 copies from any card merely by setting a dial.

Savings in reproduction costs in the first month of use were over $53,000. Time savings on reproducing individual drawings ran as high as ten days.

Card to Paper: An automatic microfilm viewing machine, relatively low in cost, was bought in sufficient numbers to strategically spot them throughout the ARGMA Engineering Department. ARGMA engineers are thus given a chance to rapidly view any one of 850,000 drawings they might need, or reproduce through the same machine an 18"x24" paper reproduction of the drawings desired.

Card to Card—Since virtually all engineering filing and reproduction at ARGMA is on aperture cards, the agency has two kinds of equipment to print from original to duplicards.

The Process

One is a small, manually-fed machine used for filing small requests.

The other is an automatic card-to-card printer which reproduces an average 600 film cards hourly. All reproduction requests are answered with duplicates, enabling the master file to remain current at all times.

The first microfilmed engineering drawing was mounted in an EAM aperture card in October 1957. Since then, about 7,000,000 microfilmed documents have been processed, representing about 850,000 engineering drawings and related documents.

Much mechanical equipment at ARGMA satisfies specific needs at the Agency for a simple reason.

Equipment suppliers stationed personnel at Redstone Arsenal to work out, with ARGMA, adaptations of existing equipment which would do the exact jobs to be done at the Arsenal.

Besides EAM microfilm work, ARGMA has put into its mechanized system other projects which tie in with and control the engineering drawing operation.

The Results

One of these projects is the Generation Breakdown. This system was devised by ARGMA's Documentation Center Personnel. This punch card deck is simple, and is furnished by contractors with the engineering drawing card. From this one deck of cards ARGMA can prepare mechanically:

(1) A complete generation breakdown to include nuts, bolts and screws for any Major Item of any given missile or rocket system, (2) Engineering Parts Lists, (3) Engineering Drawing Lists, (4) Engineering Specifications Lists, (5) Parts Usage Lists, and (6) Engineering Drawing Number Accountability.

Specific objectives gained by this generation breakdown punch card system are:

To mechanize preparation of an engineering document of parts contained in a major item component, in assembly order, of a given system; to mechanize the preparation of drawing lists; to mechanize the preparation of Specification Lists; and to mechanize the preparation of Parts Lists.

Also, to provide a mechanized method to inventory engineering drawings; to provide an aid for standardization of specifications; to expedite and assist procurement; and to mechanize the preparation of used on or next assembly information.

These objectives can be prepared as separately or in one document.

The goal of these programs has been to make work easier for both the engineer and the procurement officer. Through a combination of sound management and mechanization, the goal has been met.

Money savings under the program have been considerable, but perhaps not the most important advantage that has been gained. The rapid response of the system, and the time savings that result from this, would justify the mechanization program if not a penny were saved.

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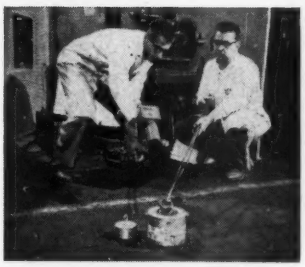

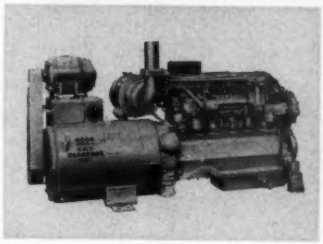

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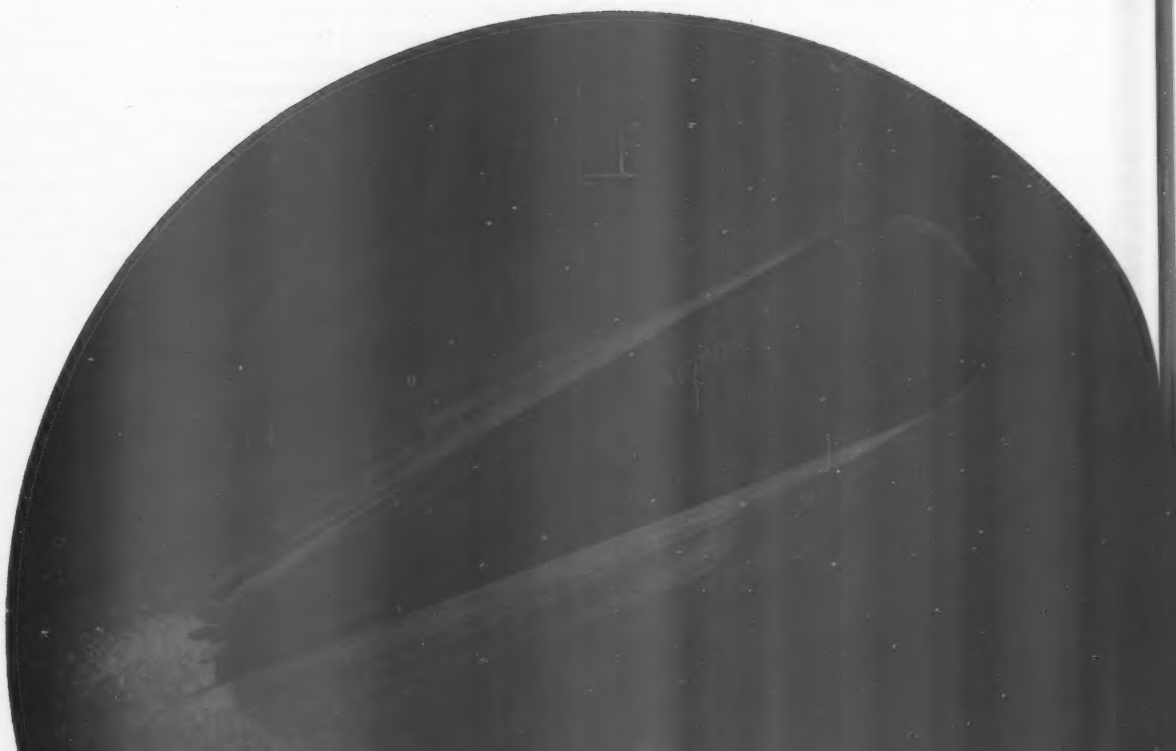
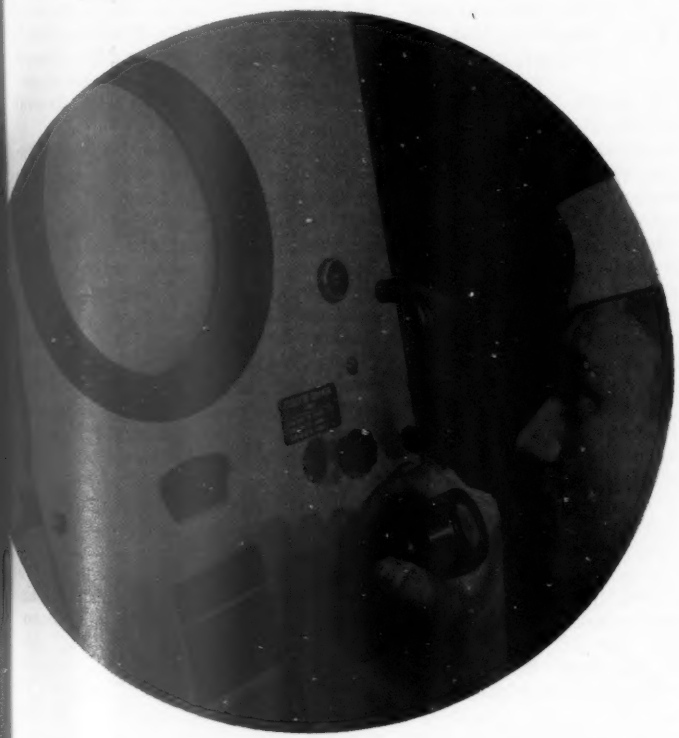
CAPABILITIES FOR DEFENSE . . .



UNDERSEA -WARFARE-

Undersea Detection and Weapon Systems ■ Acoustic Guidance Systems ■ Propulsion Systems ■ Sonar ■ Navigation and Control Systems ■ Underwater Range and Oceanographic Research Equipment ■ Subsystems for Polaris Launching ■ Undersea Vehicles

The ocean depths—hidden, mysterious, unconquered: an arena where America's fighting strength must be superior. Westinghouse is helping to meet this challenge.



For example, one of the most important new ASW systems is ASTOR—fast, silent, deadly—a true underwater guided missile. This system, now in advanced development for the Navy, is one of many Westinghouse accomplishments for U. S. undersea strength. It typifies the advanced work that for nearly 20 years has characterized Westinghouse Electric Corporation's Ordnance Department at Baltimore. You can be sure . . . if it's

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J-02324

PENTAGON PROFILE

Lt. Gen. Arthur G. Trudeau

"There Must Be Better Ways"

From the Army's Chief of R&D . . . an insight on the problems in Army research and probable solutions to these problems.

RURAL New Englanders have a reputation for being hard-headed, non-comformist individualists. ("Rock bound New England" reportedly applies as much to the area's inhabitants themselves as to the land they cultivate.)

A 58-year-old, ex-Vermont farm boy has, since April, 1958, convinced most of the Pentagon's employees that this concept of New England natives is probably correct.

The man's name: Arthur Gilbert Trudeau. His job: Army Chief of Research and Development.

Heading one of the largest and most complex military subdivisions in existence, Trudeau has had plenty of chance to show outspoken insistence on efficiency, effectiveness, economy, and a driving demand for quick, tough decisions.

(Example: he recently chastised the Army organization itself for requesting a two month extension to do more study work on a particular R&D program. The reason: it was his judgement that the loss of leadtime would outweigh the claimed potential gain.)

Trudeau's effect on Army's R&D people and machinery has been, and promises in the future to be, significant and far-reaching. His successful juggling, all at once, of a dozen problems, is a work environment not unlike that which causes one of his own pet peeves (the "too long" lead time in hardware development from concept to production).

In other words, the roadblocks he meets and generally hurdles crop up everywhere. To help him, and his successors, zero in on the critical cause of each headache, Army recently reorganized its five year old R&D setup, in effect, based on experience derived from the first centralized approach to R&D in Army's history, fully providing to the new office of Research and Development the maximum complements of responsibility and authority.

Basically: where Tech Service R&D facilities once reported through the Deputy Chief of Staff for Logistics (and then, officially at least, around the corner on a liaison basis to Trudeau, the R&D Chief now has a direct command line to R&D shops in the field.

Says Trudeau, "To some extent, this means R&D people in the tech service field setup are now wearing two hats. But these hats are as different as a fedora and a derby. This, approach was historical precedent and has proved effective in many other fields of endeavor, and we've found its a natural in Army R&D."

To fully crank up the new authority-responsibility arrangement, and in some cases to implement procedures, will probably take till the end of the next fiscal year. But the pattern has been set: Trudeau now orders, where necessary, and need not stop short at "forceful requesting."

Also, the significant point, according to Trudeau, "To exercise authority, you must have control of two things: money and people." Eighteen months ago he got the money. Now he has the people as well.

The new setup, with Trudeau's high level management capability, almost guarantees operating improvements. It should also mean a more effective prescription for some of Army R&D's most nagging headaches. Among them:

1—Lead Time—Called by Trudeau, "the time from womb to boom," this is a key factor in meeting the critical communist threat. Says Trudeau: "If we achieve a technological breakthrough today, it will be 1967 or later before our new weapon systems can be in production. (Given their present lead time requirements) the Reds could steal the information two years after we have it and still beat us to the punch. This is the real meaning of lead time."

And in an era of technological revolution, in terms of short span atomic or conventional wars, a one or two-year edge in development could be decisive.

Trudeau's goal: cutting the present 7 or 8 year lead time cycle to 4 years.

His method: "More rapid and intensive exchanges of information between industry and the Army at every stage of development, new procedures for expediting development such as overlapping and telescoping phases of the R&D cycle, conducting user and engineering testing concurrently or on a combined basis, starting production engineering and tooling as early in the development cycle as possible."

And, he might have added, "Making a clear-cut decision and making it at the crucial moment."

Lead time, says Trudeau, is "an accumulation of many things: redesign *ad infinitum*, striving for perfection when perfection is not required, administrative headaches. There can be time lags anywhere, on any project, for any seemingly sensible reason. Sometimes they are excusable because we are pressing the state-of-the-art—but this is the exceptional case and, in essence, the only valid one."

2—Planning—"There is a tendency to view R&D contracting in the same way procurement contracts are viewed. We think there are better ways to do it." Trudeau's office is investigating, among other things, the possibility of training people in contract and management schools to do the specialized type of estimating, analysis, etc., needed to spend money apportioned to R&D contracts most effectively.

Another planning problem: "There has to be more imagination in developing tactics, changes that will *demand* new hardware. Strategists and technologists should work hand-in-hand." Unfortunately, according to contentions of Army R&D personnel, there has been much conservatism, so far, to changes in tactics. More often than not, acceptance of a new piece of hardware forces the change.

The Big Hope

Trudeau's hope: The relationship between material development authorities vis-a-vis operations people will be patterned, sometime in the future, after the setup at Continental Army Command (where there is an individual deputy commander in a high position with the responsibility to pull operations and hardware together.)

At the Pentagon level, Trudeau has material R&D; operations has the tactics. Thus, at this level at present no one man can, or is required to push on both. Without the excellent cooperation and informal joint effort which exists now, a solid working relationship between hardware developers and strategists could easily break down.

3—Hardware—In the classic fields of Army development endeavor—fire power, communciation, and mobility—Trudeau sees problems and progress. The highlights:

Chemical-bacteriological-radiological research and development is on the increase. CBR, Army hopes, will see its budget increased over the next five years to three times the present level. The present gradual increase, thinks Trudeau, gives CBR a solid base on which to build an accelerating program. "There is such a thing as having money put in too fast."

Conversely, Army's needs in the whole mobility field (helicopter STOL, VTOL, air cushion vehicle) could use financial increases profitably right now. As many Army sources have complained for several years, funding in the mobility field is currently inadequate and there is too much administrative roadblocking.

Financing

Many Army R&D personnel now insist Army should have the money to finance the solid sort of R&D program in the mobility field that has been a boon to other major hardware, i.e. missile developments. This would permit planning for production, tooling at the same time that R&D is being wrapped up. Unfortunately, even though this tends to save prodigious production costs at the tail end of the line, is costs heavily in the initial R&D stages.

4—Basic Research—Trudeau, and most of his people are particularly concerned with this area—there is not enough of it. With the technological revolution, "we have drawn heavily on our deposits in the bank of basic knowledge, have not carried on the sort of program which would reimburse these withdrawals. Without basic research, in the final analysis, we can't move anywhere."

To build up the account, Trudeau has launched an extensive information exchange drive for the benefit of both private industry and educational institutions, has emphasized Army's basic research needs by issuing an eight volume Research and Development Problems Guide that runs the gamut of scientific and technological problems.

But for all his other problems, the one which Trudeau never forgets in any of this, works on constantly, is maintaining and building a high calibre of individual talent, i.e. he wants strong people. Says Trudeau:

"People with managerial talents are a paramount essential in the scientific field. But in addition, we need people of creativity, great imagination.

"We must constantly fight the orthodox, bull-headed, status quo attitude (which is, somewhere, ever-present) that what we now are using is adequate. This type of person is part of the burden, not the solution to our problems.

The Broad Outlook

"It is essential that my officers, drawn from all the arms and services, spring free from whatever hide-bound disciplines remain in today's modern Army. They must exercise creativity, imagination, broaden their outlook, when they come here (to Trudeau's office) or they are of little use to me and I get rid of them as fast as possible."

Because of his sharp, outspoken manner of saying what he believes, and following it up with action, "there are people around the shop who don't particularly care for me, but that's all right. So far, I have done my job and achieved a lot of satisfaction as a result of it."

If nothing else, Trudeau, before he is through, will have done his best to see that sound, solid management is indelibly stamped into the whole Army R&D organization. Although it sounds like something out of an Horatio Alger platitude, Trudeau has been doing his best, impressively, for a long time.

Son of a Vermont farmer, he has had two goals "since I was 10 years old." One was to be in the Army and the other was to be an engineer. "I've always had a curiosity about what makes things go around, and it has helped around here."

First in a line of eleven generations who got away from the farm (his grandfather came down from Canada to volunteer on the Union side in the Civil War, was rewarded by the U.S. government with a plot of Vermont farm land), Trudeau graduated from West Point in 1924, was commissioned a second lieutenant in the Corps of Engineers.

"I am one of those fortunate men who has managed to combine two desires into one career."

He is what he calls an "enthusiastic but not particularly good" golfer, claims playing the game helps in the Pentagon. "I've always had a curiosity about what makes things go around. There are times when it has stood me in good stead around here." And said one assistant, "Occasionally, his ability to get things done in this puzzle palace makes Snead look like a hacker." ■

Consistently right!

Why the RCA data processing skills that made history on election night are right for your business

At 8:23 p.m. (E.S.T.) on election night, the RCA 501 Electronic Data Processing System made its first prediction—with less than 5% of the popular vote tallied. From there on the RCA 501 was right—dead right—through the final count.

This kind of consistency is no accident! The remarkable forecasting performance on election night can be accomplished only by a carefully planned combination of machines and highly skilled men. Advanced analytical techniques, developed by data processing experts, made it possible to design a set of equations which could evaluate all the factors affecting the outcome.

These same advanced techniques can be applied to many business problems. For example: market forecasting. With less than 5% of total estimated sales reported, sales managers and merchandise controllers normally can accurately forecast annual sales of one or thousands of items. Thus, they can reduce possible losses involved in liquidation of overstocks, lost sales through "out-of-stocks," and the high expenses of carrying unnecessary inventories.

Leading firms and a large number of governmental agencies are already utilizing the tremendous *WorkPower* of the RCA 501. For businesses which need only part-time computer service, RCA offers the facilities of Electronic Data Processing Centers located in important metropolitan areas.

If you'd like to apply this kind of advanced data control to your business, write: RCA ELECTRONIC DATA PROCESSING DIVISION, RADIO CORPORATION OF AMERICA, CAMDEN 2, N. J.

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The Most Trusted Name in Electronics
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Army R&D . . .

(from page 19)

level, including spaces in research and development under the Army Industrial Fund, will be bulk-allotted to Chief of R&D by Deputy Chief of Staff for Personnel.

Sub-allotment will be made to technical services as prescribed by Chief of R&D. Spaces so allotted will not be assigned or transferred to non-R&D activities without prior approval of the Chief of R&D.

To manage this new responsibility properly, a new division—Manpower and Personnel—has been formed in OCRD.

Another management tool is review and analysis. In the rapidly evolving pace of science today, timely review and analysis is crucial. One mechanism, under study by the Chief of R&D, which shows promise of providing a rapid assimilation of Army R&D programs reports is automatic data processing. This should materially reduce the time needed to process reports prior to their review.

Another important review is the "in process" review. The board evaluated the "in process" review as it occurs at six critical points during materiel development. Army Regulation 705-5, outlining the "in process" review, has just been released after two years of study.

Overall Impact

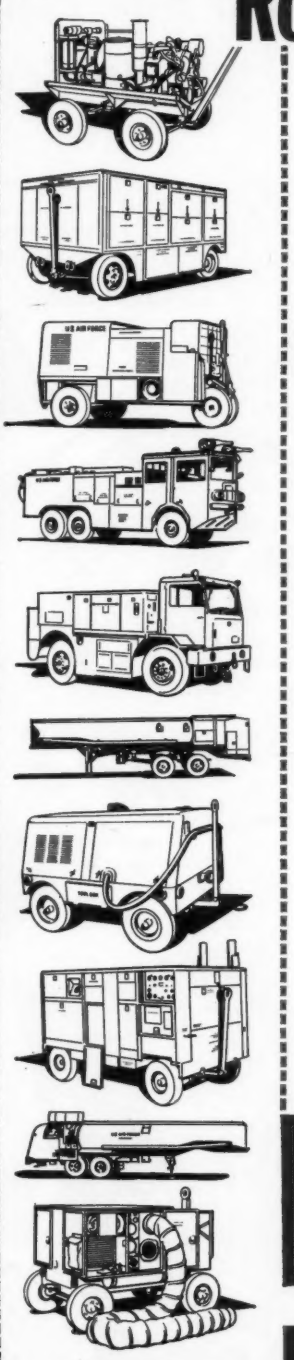
A necessary prerequisite to the authority of a procuring activity to enter into certain contracts is called Determination and Findings.

A key feature was that these documents habitually expired at the end of the fiscal year and there was a delay before they could be re-evaluated. The expiration date has now been extended for a quarter of a year. This permits legal operations while investigation of the new Determination and Finding for the next fiscal year is conducted. Also, the entire administrative procedure is being reviewed in an attempt to reduce time required to complete a Determination and Finding.

The over-all impact of the Roderick Board on Army R&D can only be reflected by history. The immediate result of the board's recommendations is to give the Chief of R&D increased responsibility, along with the authoritative direction needed for the job.

Preparedness is the primary mission, and Army Research and Development will continue to translate scientific breakthroughs into weapons and equipment to assure our continued ascendancy over Communits aims of world domination. ■

CONTINENTAL PACKETTE POWER
USE-PROVED Round the Globe



Ground support equipment built around Packette power is proving itself today on defense installations all over the free world.

Developed by Continental Motors, with the famous Continental air-cooled aircraft engines as their basis, these five Military Standard models (Mil. E2624-H) range from 30 to 250 horsepower, combine compactness and light weight with ease of servicing and upkeep, and operate at any temperature from equatorial heat to polar cold. Of special interest and importance, as simplifying maintenance in the field, is the wide interchangeability of parts among the several Packettes, and between them and the models in the Continental aircraft engine line.

They're use-proved NOW in air conditioners, compressors, crash trucks, generators, test stands, refuelers, heaters, blowers, Rollagons, multi-purpose tugs and other applications. Experience is proving: IF THE APPLICATION FALLS WITHIN THEIR POWER RANGE, NO OTHER ENGINE WILL DO THE JOB SO WELL.

WRITE FOR COMPLETE INFORMATION

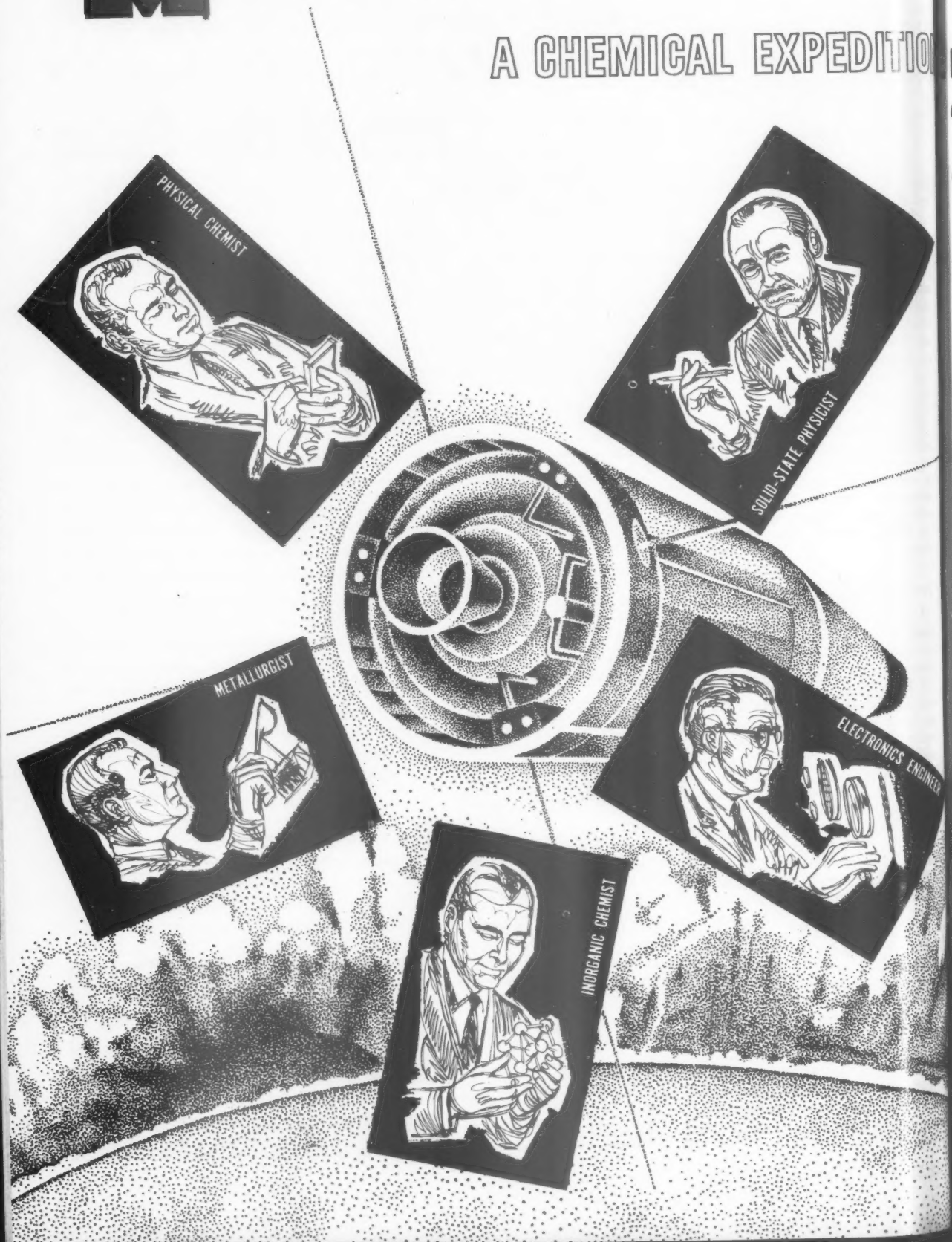
Continental Motors Corporation

AIRCRAFT ENGINE DIVISION

MUSKEGON, MICHIGAN

Monsanto **Space-Age Project "ELECTRON"**

A CHEMICAL EXPEDITIO



ranging the fields of ultra-pure metals and "intermetallics"...finds new chemical routes to materials for advanced electronics

Monsanto research in the chemistry of silicon, phosphorus, ultra-fine metals and oxides, and "super-pure" elements and compounds has found promising leads to improve semiconductors. These materials—developed by the synergistic collaboration of solid-state physicists, inorganic chemists, and physical chemists—forecast improved performance of transistors, photoconductors, thermoelectric generators and coolers, solar batteries, rectifiers, thermistors and other electronic applications that depend upon the tractability and mobility of electrons moving through special composition solids.

Monsanto researchers, from a firm base in the commercial production of semiconductor silicon (under Siemens-Westinghouse license), have found a number of intriguing leads to new and improved semiconductor materials suitable for transistors, rectifiers, diodes, thermoelectric coolers and generators, and Hall-effect devices.

Since the middle 50's—the burgeoning uses of transistors, diodes, rectifiers, as well as thermoelectric, photoelectric, and servo devices, have kept chemists on a dogged search for substances with a given quantum of mobile electrons that would behave predictably. To the "armchair chemist" the semiconductor problem might look deceptively simple: check out a relatively few elements and compounds, purify them highly, dope them in the order of 1:10,000,000 with an element from another periodic group to provide the proper *n* or *p type* conductance; and grow into crystals.

A minimum of experimentation, however, would quickly establish that the chemistry of preparing the super-pure materials and uniformly doping them to produce n-type and p-type semiconductors is one of the most intricate problems that inorganic and physical chemists have ever tried to solve. Not the least of the problem is that no reliable method has been developed to predict the energy gap; all possible combinations and proportions of candidate elements have to be prepared and the energy gap determined empirically!

In attacking this whole problem of semiconductor materials for advanced electronics, Monsanto research is focused on the following four areas of study:

1. PURITY IMPROVEMENT...
of "III-V" semiconductor compounds by at least one or two orders of magnitude over best purity yet available; and, concomitantly, studies of new techniques for converting these high-purity compounds into single crystals. When completed, a variety of new and improved electronic devices can be developed with these high-purity materials.

2. "SPOT" SYNTHESIS AND SCREENING...
of candidates in numerous classes of compounds for organic semiconductors—compounds where structural concepts point to the compounds' ability to shift electrons. (In organic semiconductors, too, uniformity and purity are vitally important.)

3. NOVEL CHEMICAL PROCESSES...
are under intense study for the preparation of compounds of group "II-VI" type semiconductors.

4. NEW INORGANIC SEMICONDUCTORS...
i.e. gallium and indium arsenides are now available for research and development. Doping of gallium arsenide is in progress.

A major purpose of this semiconductor chemistry research is to find materials with greater reliability over a wider temperature range, the ability to function at high temperatures, and variously with improved electrical, photoelectric, thermoelectric, magnetic, and photoconductance properties. By intensifying—chemically—the electronic property sought, improved devices based on these properties will become feasible. In collaboration with electronics manufacturers, the materials now on the horizon will serve in telemetry, automation monitoring devices, guidance computers, ignition systems, and communications equipment. These materials will also open the door more widely for increasing the efficiency of thermoelectric power generation, thermocooling devices, and photoelectric power generation. Promising leads are under study in "III-V" semiconductors of indium, gallium, and boron phosphides;* in new "II-VI" compounds and others.

(Please turn page.)

**F. V. Williams and R. A. Ruehrwein, J. Am. Chem. Soc., 82, 1330-2 (1960); D. E. Hill and B. D. Stone, Physical Review Letters, 4, 282 (1960).*

THE BROADENING SPAN OF CHEMISTRY FOR ELECTRONICS

Monsanto researchers have already produced a variety of unique materials chemically tailored for the particular needs of electronic engineers. These materials range from liquid dielectric coolants for "packaged" units to singularly pure, reliable-performance large crystals of meticulously doped silicon. Many more, however, like the following, are in various stages of development:

"III-V" INTERMETALLICS . . .
prepared by Monsanto Research include polycrystalline indium arsenide (now used in Hall-effect devices such as watt-meters) and both single-crystal and polycrystalline gallium arsenide for tunnel, parametric, switching, and Zener diodes.

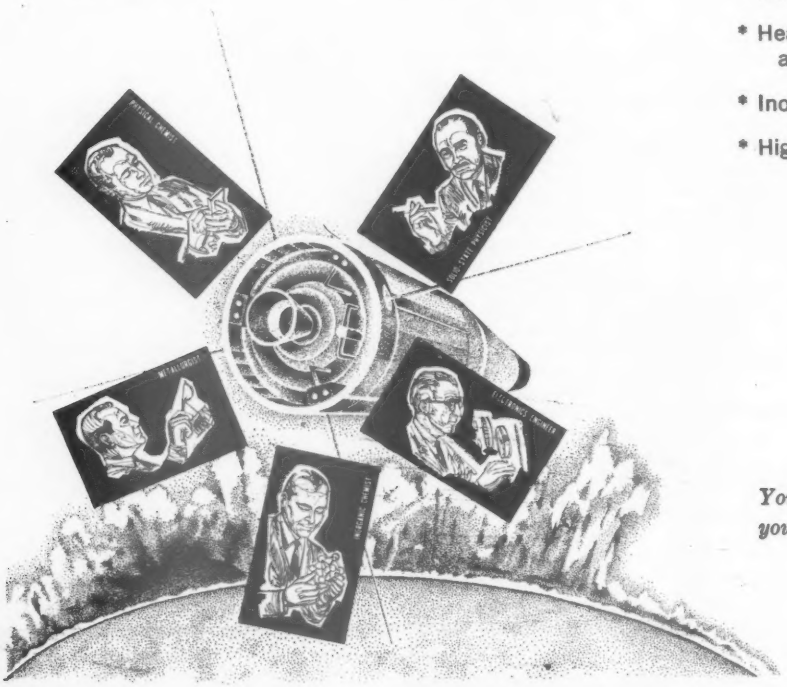
DISPERSION-STRENGTHENED NICKEL AND COPPER METAL AND METAL POWDERS . . .
are under study for corrosion-resistant electrodes, electrical contacts, and as high-strength, high-temperature core leads for electronic tubes and apparatus.

HIGH-STRENGTH CERAMIC ENVELOPES . . .
for vacuum tubes using specially developed fine mixed metallic oxides.

SEMICONDUCTORS AND SPECIAL COMPOUNDS FOR ELECTRONICS . . .

another chemical capability of Monsanto.

If your work requires special semiconductor materials; ultra-finely divided metallic oxides; electronic coolants; high-temperature potting compounds; or high-strength, heat-resistant conductors—you are invited to take advantage of Monsanto's explorations and experience in these fields. Write or call: Monsanto Chemical Company, Department 03-B Bldg., St. Louis 66, Missouri.



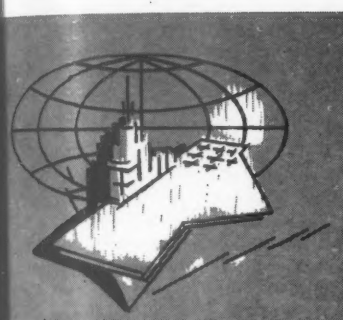
Monsanto Space-Age Projects for Government and Industry

* High-Temperature Hydraulic Fluids
* Coolant-Dielectrics for Electronic Equipment
* High-Temperature Plastics
* Improved Nitrogen Oxidizers for Solid Propellants
* Fire-Resistant Structural Plastics
* Hydrocarbon Fuels for Jets and Missiles
* Fire-Resistant Hydraulic Fluids for Ground-Support and Missile-Launching Equipment
* Radiation-Resistant Heat-Transfer Fluids
* High-Temperature Lubricants and Additives
* Radiation-Resistant Reactor Coolant-Moderators
* Intermetallic Semiconductor Materials
* Pure Silicon for Transistors, Rectifiers, Diodes
* Ultra-Fine Metal Oxides
* Materials for Vibration Damping
* Heat-Resistant Resins for Laminating and Bonding
* Inorganic Polymers
* High-Energy Solid Propellants

Monsanto

You are invited to work with Monsanto on your materials needs in the above fields.

Industrial Funding:
Will it Work in Wartime?



What has been a money-saver in peacetime deserves a comparison with wartime needs of the Navy. No matter how much money is saved, if the system breaks down under fire, it's not worth it.

by Cdr. William R. Boose, USN

KNOWING that my next assignment was to be the Naval Weapons Plant in Washington and since it is financed under the Navy Industrial Fund, a study of the operation of the Fund was undertaken in order to familiarize myself with it. A review of available material on industrial funding, indicates the subject has been covered thoroughly (and rosily) from a historical standpoint and in terms of overall operation. But, no record of any critical analysis seems to exist.

Specifically, certain unusual aspects of the industrial fund can be highlighted since they differ from industrial practice, and others seem worth looking at.

In the latter group fall a number of Industrial Fund regulations of which this author had no inkling. I therefore assume that other officers with only 16 years commissioned service are likewise ignorant.

Summing up the historical background of the industrial fund concept briefly: The first Hoover Commission report argued that modern industrial cost accounting procedures would produce significant savings compared to the then existing maximum spending limitation accounting as which bore no reference to true level of activity.

The National Security Act was amended in 1949 to provide for industrial funds, and the office of Assistant Security of Defense (Comptroller) was given the specific duty of promulgating accounting directives applicable to the whole Defense establishment.

This article is (The current one—DOD 7410.4—is dated 17 Jul 1959.) concerned only with this last directive. Previous directives are mentioned only to show a path of development.

Each service set up a Comptroller. Navy instituted a comptrollership postgraduate course which still exists. Some comptrollership was introduced in all Navy postgraduate courses except technical engineering courses.

On the first page of the Defense directive (7410.4) the first exception to industrial practice is found: "Land, plant, and equipment used in operations of the activities financed under each industrial fund do not constitute assets of the fund." Neither capital expenditures nor depreciation allowances enter into industrial fund accounting. New facilities must be provided by Congress.

In effect, the armed services have been given a proved management tool for economic control, but deprived of means to maintain efficiency through normal equipment replacement as a result of use and obsolescence. This is a serious indictment of the fund concept. It is intended to be.

Congressional appropriations are often hard to secure, and even then, only after much local planning and integration of requirements into the total Navy fiscal plan.

Stated objectives in 7410.4 of industrial funds are to: "Provide a more effective means for *controlling* the costs of goods and services required to be produced or furnished by industrial- and commercial-type activities . . ."

From experience, it appears that "computing" should be substituted for "controlling" in the directive. One can only "control" a *situation* with knowledge accompanied by *line authority*.

The next exception to industrial practice is in para. IV A which requires a charter, and is quoted in full:

"Prior to the financing of an activity under an industrial fund, a charter shall be signed by the Secretary or Assistant Secretary of the military department and be submitted to the Assistant Secretary of Defense (Comptroller) for approval. The charter shall govern such operations and be prepared pursuant to these regulations, and Department of Defense instructions issued pursuant thereto. Amendment to the charter may be proposed by the parties to the charter, subject to the same requirements for submission and approval as to the charter.

The Assistant Secretary of Defense (Comptroller) may under such circumstances as he may determine to be adequate revoke the charter authorizing the financing of any activity under an industrial fund."

Study the language of this paragraph. It would seem that various entities of the military establishments had been set up as independent by "parties to the charter." Amendments to the charter may be proposed by the "parties" but are subject to "submission and approval" by the Department of Defense.

The Navy's attitude is best shown by the following quote from NAVORD Instruction 7630.1:

"Although the regulations are effective as of 17 July 1958, some of the procedures in the areas of cost accounting, budgetary control, funding and reporting must of necessity be implemented progressively by means of Instructions and/or revisions to reference (b). Therefore, provisions of the regulations which are at variance with the existing requirements of reference (b), or other outstanding directives, will not be implemented until approved by the Bureau of Ordnance with the concurrence of the Navy Comptroller. Requests for interpretations of the scope and application of the regulations should be addressed to the Chief, Bureau of Ordnance (Code Fil)."

Obviously, a realistic working compromise has been reached.

Regarding services furnished, the basic requirement is that they be reimbursable. The stipulation that the charges are not subject to reporting requirements (similar to those applying to allotments) gives the commanding officer greater flexibility than in the past, since temporary over-expenditures can be made during work progress. Such is not the case with either appropriations or allotments.

Outside Work

Further, besides supporting the Naval establishment—

"Services may be furnished by industrial fund activities, upon request, to other Government agencies, agencies of state and local governments, foreign governments, Government personnel and other purchasers or users outside the Department of Defense, when so authorized by law, provided that sales to ordering activities for which reimbursements will not be received from Federal Government appropriations shall be for cash or its equivalent. Advances to pay for services requested by private parties and customers outside the Federal Government may be required in the interests of prudent management."

It is clear that authority to render services to various activities is broad, covering almost every conceivable situation. Services to foreign governments are routine in shipyards. Those to other government agencies and state and local governments are usually of an emergency or nonrecurring nature.

Since it is Defense policy not to compete with private industry, services to industrial customers are rare. Requests from industry usually involve some special facility which the Navy possesses and has excess capacity but which would not be economical for industry to acquire and maintain.

An excellent example of this is David Taylor Model Basin which tests hull designs for shipbuilders regularly on a "not to interfere with Navy projects" basis.

The basis for reimbursement is also broad and can be made "on the basis of costs incurred by that activity, or on the basis of fixed prices or predetermined rates established to recover costs, *excluding unfunded costs* . . ."

This last phrase divides customers into two separate groups: those within the Federal government, and then all others. "Funded" and "unfunded" costs will be discussed later.

Surplus Disposal

Disposal of surplus and excess property, and the salvage and sale of scrap, always poses procedural problems for government activities, and Navy is no exception. But provisions have been made for NIF activities that should greatly ease disposal.

Surplus property may be donated without reimbursement for educational and public health purposes (including research) with approval of Secretary of Health, Education, and Welfare plus the Administrator of General Services. All costs (packing, shipping) incurred by the NIF activity are reimbursed by the applicant for the property.

Salvage and scrap sales are handled somewhat differently. Proceeds from sales are deposited to the credit of the industrial fund, expenses are charged to activity operating costs.

With respect to general accounting, Defense directive 7410.4 is very specific: funds "shall observe the accrual basis of accounting and employ the double-entry method of bookkeeping."

Cost accounting must be integrated with the general accounting system but may be on either job order, process, or a suitable combination of both. The whole accounting system is to be especially designed for the specific fund in question.

At first, cost accounting must be based on predetermined data. But instructions clearly state that a "standard-cost" system is preferred and shall be used whenever appropriate. Rates set shall be "sufficiently conservative" to be challenging. Allowances are required to be made for variances.

Regarding overhead, the Defense directive states that "flexible" or "variable" budgeting is to be used wherever practical. However, this concept is not yet widely used.

Charges for "under-utilized or unutilized plant and equipment" are billed to the agency requiring their maintenance. This is a large item in many defense activities since mobilization potential must be preserved. Due to the difficulty of determining the potential, this factor also has yet to be used much.

Unfunded Costs

Statistically, any generally acceptable method of allocating overhead can be used but it must be broken down into two categories: items for direct operation of the NIF activity, and those allocated to tenants.

At the Naval Weapons Plant, for instance, among the tenants are: the Potomac River Naval Command Headquarters, the Armed Services Police Detachment, the Naval Reserve Training Center, plus the reserve training submarine USNRS DRUM, and the Experimental Diving School, etc.,—over 30 in all. Charges to these activities are funded by the bureau operating them.

As previously mentioned, "unfunded costs" would be discussed separately. These costs are those for which the NIF activity is *not reimbursed* by an activity of the Federal government, but which must be charged to other activities-state, local, foreign governments, etc.

"Unfunded costs" include pay of military personnel assigned plus allowances for depreciation of government owned plant and equipment. Military pay records are readily available. But depreciation allowances can only be computed through statistical accounting as mentioned earlier.

On receipt/expenditure records, another deviation from historical Navy practice appears. All such records are maintained locally, with appropriate supporting evidence. Only in exceptional cases where original records are needed by the General Accounting Office must complete duplicate files be prepared.

Budgeting is in accord with accepted industrial practice and is done annually, with mandatory review quarterly, plus monthly financial statements.

(Continued on page 50)

HAY...

A meadow—
of no military significance.
Not far away a vital military area.

...PRESTO!

A convoy arrived
Thunderbird deployed in less than an hour.
The defence requirement changed
Thunderbird moves rapidly to where next needed
A meadow remains

The English Electric THUNDERBIRD is:
The standard Army A.A. guided weapon
Completely mobile
Easily assembled and serviced
Being developed with C.W. techniques
to extend low level range and now
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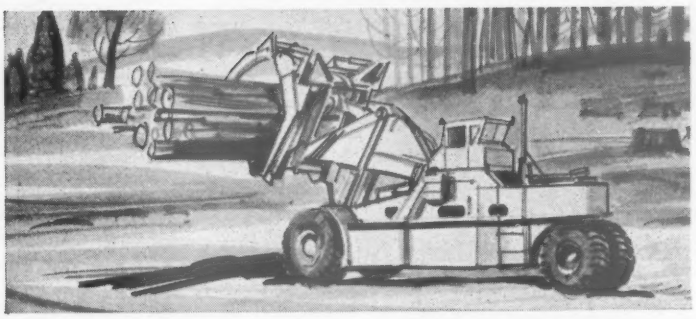
speeds big loads
TORQMATICALLY

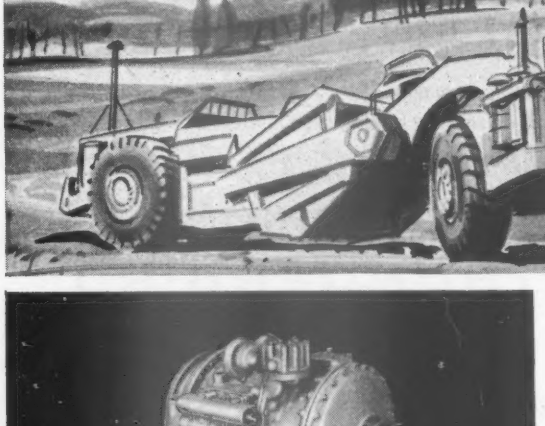


IN "LUMBER JACKS"

Despite a 70,000-lb. lift and carry capacity, the Wagner LJ 3-70 Lumber Jack is designed for fast work in mass-production operations. Its CRT-5630 TORQMATIC DRIVE lets the operator quick-shift at full throttle to speed loads—one reason why it is standard equipment in this machine.

IN TWIN-POWER SCRAPERS

One contractor who owns a Euclid TS-24 Twin-Power scraper reports: "One Twin is equal to five 130-h.p. crawlers with 10-yd. tow-type scrapers." Another says: "One Twin is equal to three 12-yd. self-propelled scrapers plus pusher." Typical? You bet. And the CRT-5630 is one of the TORQMATIC team members that make twin power possible.



IN ANY 200-300 H.P. UNIT

For that scraper, king-size loader or four-wheel prime mover, you'll find faster job cycles and lower maintenance costs with the job-proved CRT-5630 TORQMATIC DRIVE.

It has 3 speeds forward and 3 reverse, planetary direction and range gearing, transfer gearing drop box incorporating front- and rear-output flanges. With six choices of TORQMATIC converters to give that perfect engine match, the CRT-5630 is ideal for a wide range of machines and jobs.

Want more information? Send for the fact-packed CRT-5630 brochure today.

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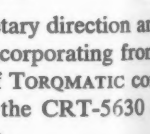
The world's most complete line of hydraulic drives

Over 980 models used by 108 manufacturers in 100 to 525 H.P. equipment



Allison Divison of General Motors
Dept. AF-2 Indianapolis, Indiana

Please send me application data on your CRT-5630 TORQMATIC DRIVE.

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Company_____

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Newsletter

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National President: Hon. George H. Roderick **Exec. Vice Pres.: VAdm. Harry E. Sears, USN, ret.**

Chapter Briefs

Our hard working and dedicated national president, Hon. George H. Roderick, addressed two overflow chapter meetings within a week recently, something of a record for an AFMA head. Both meetings were dinner affairs and were coordinated with visits to military installations in the areas. The first meeting was held with the *San Antonio* Chapter at Fourth Army Headquarters, Fort Sam Houston on 13 October; the second, with the *Chicago-Great Lakes* Chapter at Headquarters, Naval Air Reserve Training Command, Glenview.

The meetings had much in common. Both were sponsored by outstanding chapters and the evening's program beautifully planned and executed. Both were well attended. All services were represented at both meetings, and included among the honored guests were senior military commanders, and prominent civilians from the local communities. For example, at the San Antonio meeting (200 in attendance) were: Lt. Gen. E. T. Williams, CG Fourth Army and his deputy, Maj. Gen. L. S. Griffing; Maj. Gen. John F. Bohlender, CG Brooke AMC, and Brig. Gen. J. L. Snyder and R. E. Blount of that command; Maj. Gen. William T. Hudnell, USAF, CG SAAMA and his deputy Brig. Gen. Dorr E. Newton; Cmdr. Thomas E. Craig, CO Naval Reserve Unit, and Maj. G. H. Stewart, USMC, his deputy; Col. Milton S. Glatterer, Post Commander at Fort Sam Houston, many other officers and some senior NCO's.

Guests from the local community included Gen. William H. Simpson, USA Ret.; J. Edwin Kuykendall, Mayor of San Antonio; Father Walter J. Buehler, President of St. Mary's University; Alex H. Halff, President of the Junior Chamber of Commerce; Jess J. Lass, W. W. McAllister, Jr., J. D. Falk and Charles B. Cooney, all presidents of local banks; Col. Clarence Brand, Ret., President United Services Automobile Association, and many of our fine corporate member representatives. A large percentage of wives also attended.

Officers of the chapter include: James H. Leverenz, President; Col. H. H. Newman, V.P.; Miss Lee Enderlee, Secretary-Treasurer. (More on the Glenview meeting in our next Newsletter.)

New York Chapter provided its membership with a unique and highly profitable evening recently when Glenn L. Montgomery presented a summary of the 1960 National Conference, complete with colored slides and a resume of each speaker's remarks. National Headquarters commends Montgomery, an executive with American Telephone and Telegraph Co., on his valuable contribtuion to his chapter program and to the Association's objectives. Newly elected officers of the New York group include Col. Earl Ashton, President; Glenn L. Montgomery, V.P.; Lt. Col. Benjamin P. Fowler, Secretary; and Morris Yankofsky, Treasurer. For their services to improve management and chapter activities in the past year, chapter awards were presented to: Lt. Col. Robert Bentley, Mrs. Dorothy Schoonmaker, and Morris Yankofsy.

Command Support

Over two years have passed since we instituted our new AFMA program, and the material results of doubled membership, eight new chapters and corporate membership rise of over 800% have been pretty well publicized. Less well known—but probably more important, we feel—are the reports of the intangible benefits to individuals and commands which we are constantly receiving—of inspired management improvement consciousness, of the desire of enlightened personnel to get the job done better, quicker, and at less cost, of improved morale and better public relations. These are the tangible "intangibles" of utmost concern to the civilian secretary at the seat of government, and the military commander in the field.

A successful chapter operation with attendant benefits to our national defense effort described above, requires two important ingredients: an enthusiastic and dedicated chapter membership and *command support*. There can be no success when one of these essential ingredients is lacking. By the same token, where both are present, there is no limit to the contributions which the local AFMA chapter can make to the commander's mission accomplishment. It is for this reason that we earnestly solicit commanders in the field to support their local AFMA chapter or, if none is available, to encourage the formation of a local unit.

Bibliography

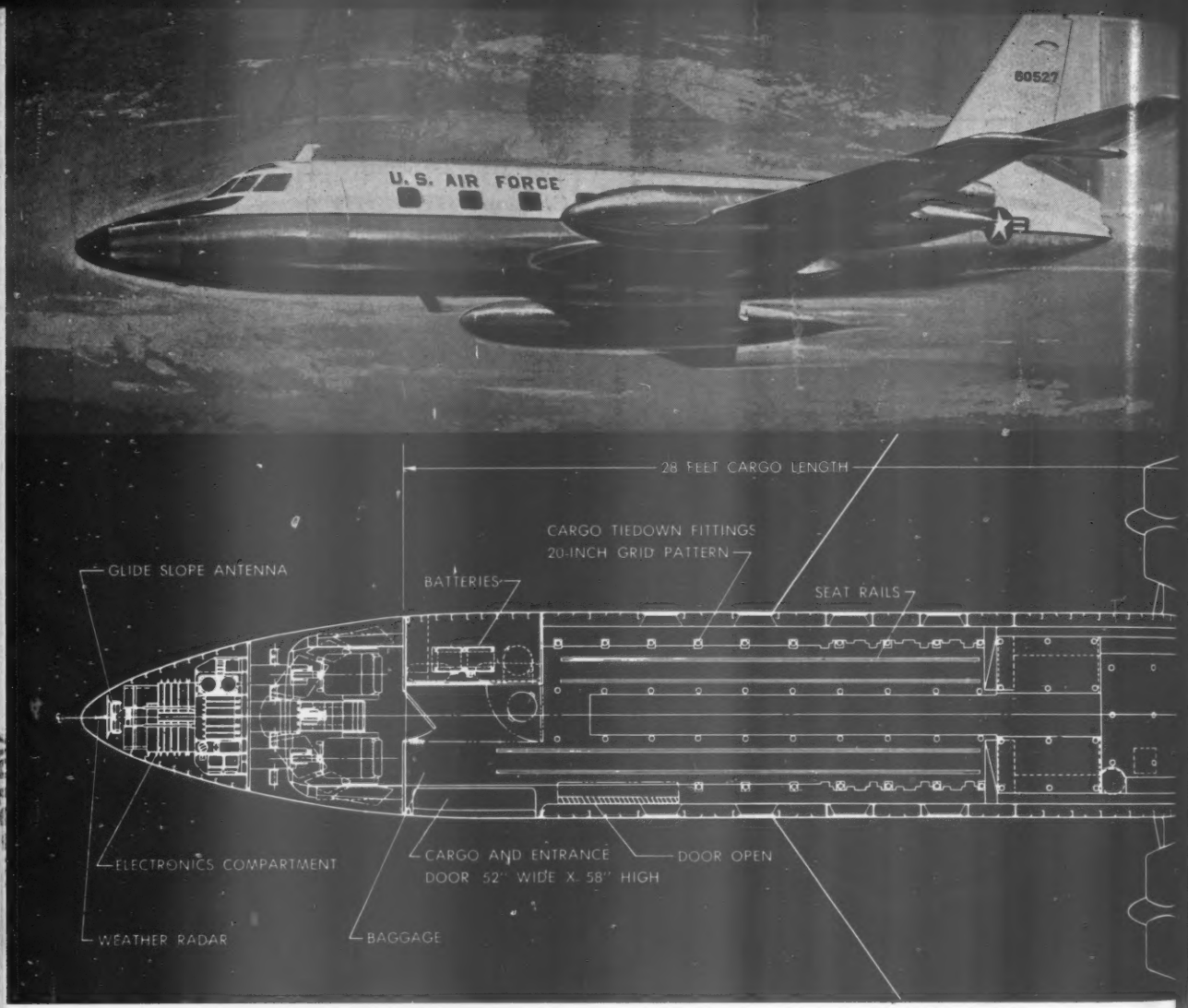
Our industry members, particularly, will be interested in the new 1960 Edition of *Armed Services Procurement Regulations,* now available for order at the Government Printing Office. A new subscription service has been incorporated with this issue, thereby eliminating individual orders for revisions.

Another valuable publication by GPO is the 1960-61 edition of the U.S. Government Organization Manual.

Administrative

A misprint in the National Conference Application Card in back of the new AFMA JOURNAL carried the dates 19 and 20 April for the Reception and Awards Banquet, respectively. These dates should read 28 February and 1 March. All holders are requested to make this correction.

Next National Conference: Shoreham Hotel, Washington, 28 February-2 March. Plan to attend.



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Research Rundown

QUIET BUT STEADY PACIFIC MISSILE RANGE BUILDUP over the past year or so has major significance for the nation's space programs, but has gone all but unnoticed. The reason: to avoid what one Pentagon officer calls the "Cape Carnival space circus approach."

ONE MEASURE OF WHAT'S HAPPENING AT PMR is that during the next year, it will, for the first time, fire more major missile shots than Canaveral. Besides the relative privacy the Pt. Mugu facility offers, launches from that spaceport have a clear shot down the Pacific, avoiding the possibility of infringing on foreign territorial/airspace rights. Need for this, obviously, is stressed by current unrest in Cuba, Central America.

FURTHER INDICATION OF PT. MUGU EXPANSION is the list of some 15 major construction projects now underway, with a total price tag of over $7.5-million. Footnote: less and less work—with the exception of component testing—seems to be in the wind for White Sands Missile Range.

BIGGER AND BETTER POLARIS MISSILES seem to be Navy's current aim, with the A-2 Polaris test program now underway. Initial version of the sub-carried missile is almost all of the way through its flight test program. A-2 increases missile's range from about 1200 to about 1500 statute miles. Best guess on eventual range of advanced missiles: 2500-3000 miles.

WHAT COMPUTERS MEAN TO AIR DEFENSE of the Continental U.S. was nicely summed up by an executive with Radio Corporation of America. His comment: that with optimum computer facilities, the men with the responsibility for retaliation could have all of the information on how many to shoot at what within about ten seconds after the first incoming missile was spotted.

A NEW "GAP" HAS BEEN POINTED OUT BY TOP ARMY Researcher Dr. Richard S. Morse, this one in the field of Army Aviation. Where it lies: between the biggest Army cargo plane (the Caribou) and the smallest Air Force plane. For the future, this gap—from all present indications—is likely to grow rather than shrink —Air Force is not buying new "small" cargo craft, those that it has are running to the end of their useful life.

SOME HELP FOR THIS AVIATION GAP could come from the well-underway V/STOL joint development program. Navy should get its first invitations to bid on basic design out soon, incorporating Army and Air Force needs in the invitation it sends out.

AMONG THE VTOL CHARACTERISTICS DESIRED will be a cruising range of about 1500 miles, four-ton payload, 300 knots speed. Best guess on program cost is in the $70-million range for a prototype. All in all, the program will add up to the largest joint development ever undertaken by the services, may point the way to more of the same in the future if it works out well.

MACHINES AREN'T LIKELY TO REPLACE PEOPLE, in spite of some space age indications to the contrary. Air Force in particular seems to have realized this, is working hard in the area of personnel management improvement (see page 20, this issue). Also, Army has just wound up its annual conference with industry on human factors in equipment development.

FULL-SCALE BRITISH THUNDERBIRD DEVELOPMENT program recently launched has nothing to do with the sports car market, rather aims to provide the British Army with a "sophisticated and extremely lethal" antiaircraft rocket. Follow on to T-Bird Mark I, the Mark II will provide more potential than any other system yet studied, according to the War Ministry.

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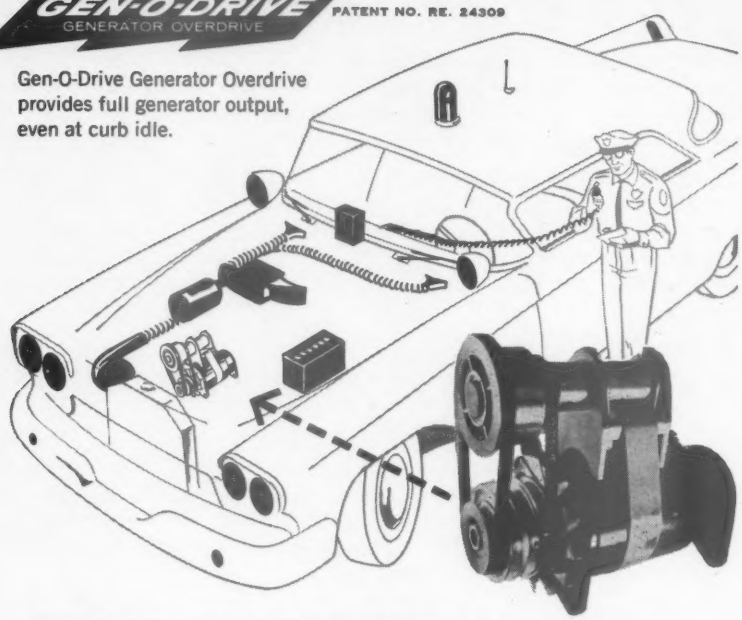

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Research Rundown

SAMOS Project Under One Pentagon Office

The top priority Samos project has been placed under the supervision of a single Pentagon office by the Air Force. The single-line authority between Air Force Secretary and field staff eliminates decisions filtered through the chain of command.

A step believed necessary by Air Force planners and the chief of the new Missiles and Systems Office, it will accelerate readiness of the SAMOS. Samos is an Air Force globe-circling observation satellite.

Another management system closely resembling the new setup is the one Navy used to develop the Polaris submarine in record time.

Air Force top brass believe the management system, which has been in operation just over a month, will have the cumulative effect of hastening the operational date of the satellite.

A target date for Samos operational status has apparently not yet been set. However, planners are budgeting for what they call a research and development program "in depth," meaning that a major and persistent effort will be made to orbit Samos, assuming present policy is continued.

Checkout Study Set For Future Weapons

Next-generation design criteria and maintenance philosophy for future Air Force weapon systems and related test and checkout equipment will be the subject of a study run by Motorola, Inc., and Douglas Missiles and Space Systems Engineering Department.

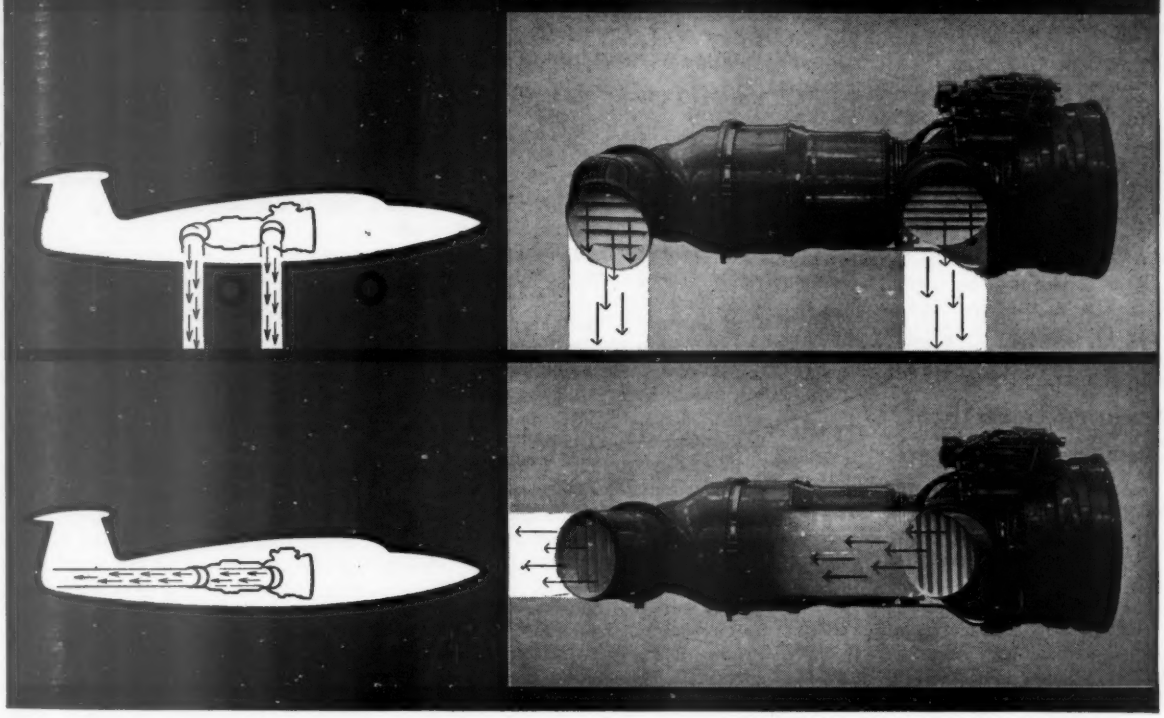
To be run under Air Force direction, the study aims to (1) validate operational and maintenance requirements for test and check-out across the spectrum of future Air Force weapon systems for the period ending 1975.

(2) Corroborate design criteria which will provide a logical basis for insuring compatibility of future weapon systems and their associated test and checkout equipment.

(3) Set the feasibility of standardizing components of test and checkout equipment and the methods of testing and checking out future weapon systems.

Finally, (4) Determine the feasibility of designing an integrated multipurpose automatic test and checkout system or family of systems for use with future weapon systems.

LIFT and THRUST from ONE ENGINE— the Revolutionary BS 53 Turbofan



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Only Money Needed For A-Plane—Branch

"A downhill run" on development of an atomic powered airplane is predicted by Brig. Gen. Irving L. Branch —if that program emerges from the fiscal 1962 budget process "unscathed."

Branch, director of ANP efforts in Defense and Atomic Energy Commission, said that the forthcoming budget is the "last big crisis facing us," and predicted that his budget recommendations would be accepted.

Branch also said he hopes to declassify the entire ANP program in the fairly near future. Most likely airframe for the A-plane will be one designed by Convair for the now defunct project CAMAL.

Decision must still be made on whether an indirect- or direct-cycle reactor system will be used. However, Branch said, the shielding problem is "virtually solved." Target date on the program—at least for the reactors—is sometime in 1965.

Seaborne Satellite Launches Proposed

Demands on vital powerplants in space vehicles and satellites are increased and complicated by limits on U.S. launch site locations, says RAdm. C. B. Martell, Assistant Chief of Naval Operations (Development).

Speaking to a space power systems conference of the American Rocket Society, Martell said the "necessity of 'dog-leg' or indirect approaches to required orbits consumes power that wouldn't be wasted if mobile launch facilities were available."

He continued, "Azimuth restrictions of our land launching sites can be greatly relieved by seaborne launchings with the added advantage of privacy —enjoyed by the Russians, but totally absent in our fishbowl procedures at Canaveral and Vandenburg."

Martell said a mobile launch program can have a long life and the facilities can be used repeatedly. "While mobile launch facilities will establish new dimensions in our space operations, they will also place new demands on auxiliary power systems.

"Historically, Navy's power demands and the new requirements of power in space have had many parallel features. Each involves extended periods of reliable operation in isolated vigorous environments under rigid pace and weight limitations."

Human Factors Are Conference Subject

Physical and chemical phenomena involving what U.S. soldiers see, smell, hear and feel, and how they react psychologically and physiologically to these elements, provided discussion subjects for Army and industry scientists at the Army's sixth annual Human Factors Engineering Conference held at Fort Belvoir, Virginia recently.

On the theme "Army, Industry and the Soldier," 250 scientists emphasized teamwork with industry is needed to assure compatibility of weapon and equipment to the troops.

Reactions to the conference foreshadow increased emphasis on human factors in efforts of design engineers to arm and equip the soldier.

The conference was by the Army Chief of Research and Development and hosted by the Engineer Research and Development Laboratories.

One of the speeches of the conference was "The Soldier First," given by Maj. Gen. Louis T. Heath, Deputy Chief of Staff for Material Developments, U.S. Continental Army Command.

New "Missile Master" Will Be Cheaper

A "poor man's Missile Master," called BIRDiE (for Battery Integration and Display Equipment) has gone into production, and will eventually control as many Nike missile sites as its bigger counterparts, Missile Master and Missile Monitor.

Developed and manufactured by The Martin Co., the new Army control system will do basically the same job as the larger versions, but will be used on Nike sites where smaller numbers of missiles are installed.

Cost of the smaller system will be only about one-twentieth of the larger systems. BIRDiE will be tailored to the exact number of missiles each is to control, unlike the larger versions. Compared with Missile Master, BIRDiE will only be able to control about two-thirds as many missiles.

Where Missile Master requires an eighty-man maintenance crew, BIRDiE's transportable system can be maintained by 12-14 men.

Five Factors Set For R&D Contracts

Army's Chief of Research and Development has told industry that the government is now putting a premium on five factors in awarding research and development contracts.

Lt. Gen. Arthur G. Trudeau said these factors are: speed; comparative costs; full use of talents in private industry; location and calibre of technical know-how; and the need to sustain reasonable government competence.

Trudeau said 90% of Army's missile work is now handled under contract. Under Army's missile program come some 19 rocket and missile programs.

He called for greater concentration on lead time, and said "we must continue to adopt new procedures to expedite development." Such procedures would include telescoping parts of R&D work, concurrent testing, and a greater use of concurrency.

Lightweight Equipment Assists Army Troops

Significant progress towards providing Army's forces with lighter, more efficient combat equipment has been cited by Department of the Army.

Maximum mobility through reducing bulk and weight of equipment has been the aim of the program, spearheaded by Chief of Army Research and Development.

Side benefits in the program include shorter training time because of equipment simplicity, lower inventory levels because weapons with fewer parts are more efficient, and less maintenance because simple weapons last longer.

Much weight reduction has come from using plastics and newer, lighter metals.

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Procurement Trends

ONE WRINKLE IN THE UNIFIED COMMAND organizations that needs to be ironed out has been spotted, should be licked shortly. With the advent of these commands, heaviest stress—logically—was placed on operational integration, perhaps not enough on the various support functions. What has happened: Logistics, for instance, has been slow to fall into line as a unified staff function, has been something of a headache to Unified staffers.

ERA OF THE CHANGE ORDER MAY BE ON THE WAY OUT, judging by Air Force/Navy skepticism about these changes on such programs as Sky Bolt and the carrier Enterprise. Time and cost are the big reason these Monday-morning quarterback measures don't pay their own way.

POSSIBLE NEW HELICOPTER BUY FOR GERMANY is the Sikorsky S-64 Flying Crane. The West German Defense Ministry has ordered two of the rotary-wing craft for evaluation through Weser. Besides the German order, Sikorsky is building two of the craft for general NATO evaluation.

MATS' NEED FOR FASTER TRANSPORTS was sharply underlined by recent Congo airlift. AF C-54's took between four and a half and five days to make the round trip from Chatauroux to Leopoldville, what with refuelling and crew rest stops. In contrast, one European commercial airline, flying new jets made comparable round trips in a day's time.

MORE MATS' HEADACHES—IN GETTING AIRLIFT BIDS—have been outlined by top MATS' officers. One example: because AF uses mobilization expansion potential as one means of selecting contractors in this area, many airlines get options on each other's planes, to be exercised by the one that wins the contract. The result: listings of available aircraft by bidders bear uncanny similarity, lean more than a little to a paper potential only.

TO FORCE BETTER PROCUREMENT IN THE MILITARY, Armed Services procurement officers are talking tough with industry contractors, warning that, if a better case for economy and efficiency isn't made in budget testimony before the new Congress, another meat cleaver across-board cut can be expected.

INCORPORATION OF SAFETY DEVICES INTO MISSILE weapon systems in the earliest stages of design and development is being encouraged by Lt. Gen Joseph F. Carroll, Air Force Inspector General. This will call for closest cooperation between Air Force and industry.

COMPLETION OF THE 1960 "PROJECT MONA LISA," in which commercial carriers delivered about 50,000 tons of cargo to remote military stations in Alaska, has been announced by the Army. This is the fourth year the annual resupply mission has been handled by commercial carriers.

MORE STRESS ON INCENTIVE FEATURES must be given Air Force contracts if defense contractors are to demonstrate the kind of procurement efficiency Congress is demanding, says AMC Commander Gen. S. E. Anderson. He also said "We can continue to expect arbitrary across-the-board budget reductions in attempts to make us do a better job if we fail to present evidence of new efficiency in making our case before congressional committees."

AIR FORCE SINGLE MANAGER PROBLEMS are on the horizon in the general supplies area. Problem #1: how to scare up enough bodies to man the AF workload in this area. AF successfully argued that original requests for 2400 men were patently impossible, is not much happier with a compromise figure of 1200. The reason, and Problem #2: AF has handled this sort of equipment on a local-purchase basis in the past, has no way of singling out "specialists" to fill the job slots, wonders whether the whole idea of centralization isn't more trouble than it's worth.

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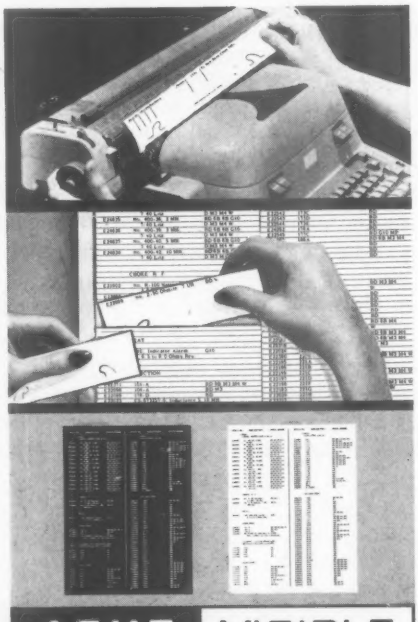

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Procurement Trends

Dollar Penalty Set On AF Reliability

Cash penalties or price decreases may face future contractors who fail to meet Air Force reliability standards, under a new statement of Air Force policy.

The new policy (in AFR 375-5) stresses enforcement provisions and avoids previously permissive treatment of this area. The new document comes in the face of mounting complexity of weapons support and command control systems. The drive has been intensified with the advent of space systems, and is particularly aimed at getting reliability early in the system development cycle.

The policy states that reliability efforts of contractors, "including both past performance and proposed programs" will be a major factor in all source selection action.

Among other guidelines: (1) Each program in development and production is to include numerical probability values from minimum acceptable to desired goal. (2) Specifications and contracts are to include "specific minimum acceptable reliability requirements as one of the major engineering factors," and contracts will include requirement for a comprehensive contractor reliability engineering program.

Further, Air Force has stated that it will, in the future, keep a much closer eye on the reliability performance of its contractors.

New Grenade Launcher Announced by Army

Development of a new and larger weapon for the infantryman to supplement his hand-gun arsenal has been announced by Army Ordnance Corps.

It's a 40-mm grenade launcher which will fill the gap in range between the hand grenade and the mortar.

Developed and produced by the Springfield, Mass., Armory, the grenade launcher weighs six pounds and fires ammunition developed by Picatinny and Joliet Arsenals.

The shoulder-fired weapon has an aluminum barrel, a radical innovation made possible by the low velocity and pressure which fires the six-ounce projectile.

The projectile travels at 250 feet per second and is designed to knock out enemy bunkers, machine gun nests or small troop concentrations. A delay arming fuze provides a safety factor for the soldier.

Navy Wages Campaign To Cut Contract Costs

Navy contractors have been warned that costs that might have been reasonable a year ago will not pass the tests today.

This warning, issued by the Navy, is a part of its vigorous economy drive to cut the fat off Navy contracting.

The Assistant Secretary of the Navy for Material, Cecil P. Milne, called upon industry to intensify its efforts to reduce costs all down the line.

He cited the 3% across-the-board cut in procurement funds by Congress as a "clear challenge to the Department of Defense, the military departments, and their partners in the industry-defense team to get maximum value for every dollar spent."

He cited advertising as a potential savings area. He also suggested contractors take note of recent findings by the House Manpower Utilization Subcommittee on the high costs of recruiting personnel.

Another First Scored In Data Processing

Navy Aviation Supply Office has another first in the annals of data processing systems—having installed the first IBM 1401 system delivered to any installation in the world.

Currently, IBM's manufacturing and engineering organizations are building two modified versions of the 705 model III for installation in ASO in late 1960.

Aviation Supply Office is responsible for setting requirements, plus procurement, distribution, control and disposal of all naval aeronautical material throughout the world, excluding complete aircraft and engines.

ASO claims much of its success in supporting naval aviation can be attributed to its pioneering efforts in the field of data processing, which today is paying dividends in keeping naval aircraft in the air instead of being grounded for lack of spare parts.

Spares Discrepancies Cleared up by AF

A new directive to correct discrepancies in aircraft spare parts repair programs has been insured by Air Force.

The new regulation (AFR 121-31) notes that "deficiencies within the base portion of the spares management problem are most often caused by lack of aggressiveness by responsible personnel in conducting an expanded base level repair program."

In a recent study, AF found that bases are not completing repair of spares to the extent possible with available facilities and manpower.

The study team noted, among other things, (1) failure to thoroughly analyze available maintenance data to identify excessive spares or systems failures; (2) frequent evacuation of reparable spares from bases with little or no attempt at base repair; (3) spares not identified, conditioned, coded or dated upon removal from aircraft; (4) lax base procedures controlling inspection and bench check functions on reparable aircraft spares and (5) excessive time in routing spares.

Small Business Awards Are Below 1959 Volume

Fiscal 1960 prime contract awards to small business fell below the volume in fiscal 1959, Defense Department has announced.

But at the same time, small businesses received $3.5-million in military subcontracting from 293 large companies enrolled in the defense small business subcontracting program in fiscal 1960.

This, DOD said, is the largest annual total since officials started compiling figures under the program in 1956, and a $243-million increase over fiscal 1959.

Prime contract awards to small business firms totaled $3.4-billion during the year, DOD said, showing that the total small business share of military procurement continues at the four year average—more than $7-billion annually. During the same period total prime contracts to all business firms have averaged over $21-billion yearly.

As of January 1960 the small business subcontracting program has changed from voluntary to mandatory. "Since this mandatory program applies only to new contracts awarded after January 1, 1960, it had little if any effect on the number of contractors reporting subcontract payments in the January-June 1960 period," a DOD spokesman said.

AF Procurement Regs Get New Guidelines

Contractor relations, weapon requirements, the execution of contracts and other matters will be covered in a new set of guidelines for Air Force procurement.

Among other things, the new guidelines will discourage use of sole source procurement, letter contracting, and contract re-determination as a substitute for accurate, careful pricing in the first place.

Air Force is conducting a drive to cut weapon costs all down the line and to improve the overall Air Force contracting structure. Both houses of Congress have been critical of AF procurement practices in the past, and many of the new moves are seen as answers to various Congressional criticisms.

Procurement people are encouraged to use more formal advertising, and to discourage contractors from beginning work on a given project before all contract details are firm and in hand.

More Men Needed For New Navy Gear

Skyrocketing complexity of equipment is virtually doubling Navy's maintenance manpower needs on two of its newest, most advanced aircraft, says Adm. J. S. Russell, Vice Chief of Naval Operations.

Russell told a meeting of the Fleet Reserve Association that it will take 14 men to maintain the two-seat F4H all-weather fighter, twice the number required for the F9F.

Also, Russell said, "it took about eight men to maintain an AD-6 Skyraider attack plane—it will take about 19 men to maintain its successor, the A2F Grumman all-weather attack plane when it gets to the fleet next year."

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The Ninth of Fourteen Erroneous Postulates

9—An organization is formed by delegation and operated by supervision.

by Leland B. Kuhre, Col., USA (Ret.)*
Founder and Director
The Academy of Organizational Science

In books, manuals, courses, and advice, *delegate and supervise* appears to be the prevailing answer to *how to organize;* it is in rule, method, exhortation, admonition, and panacea. Repetition and prestige-utterance implant it in mind as a self-evident truth from which to derive practice.

The Oxford Universal Dictionary shows first English usage of *to delegate* in 1530: "to entrust or commit (authority, etc.) to another as an agent or deputy." (Its origin is Latin, *lex, leg,* law.) *A delegate* is "a person sent or deputed to act for or represent another or others; a deputy, commissioner." A *delegant* (1627) or *delegator* (1875) is one who delegates. General usage is political. Specifically in *Civil Law* it pertains to debtor-creditor relations. In *Law* a delegate cannot delegate. Organizational usage is not recognized.

When *delegation* is used, it limits the size of an organization. The head is the delegator. He entrusts delegates with his power and authority to act for him in developing such functional fields as he may designate. But there it must stop; his delegates (a) cannot delegate.

To meet the 20th century demand for large organizations, *re-delegation* is used—a concept foreign to root, trunk and branches of *delegation.* The delegator (head) extends himself through delegates (a) when they re-delegate a portion of his entrusted power and authority to delegates (b); thus the latter also act for the delegator, but in less broad, arbitrarily determined, functional fields.

The delegator extends himself still farther as re-delegation is repeated until each chain ends in a delegate (n) where 'n' is on the so-called front-line of management or supervision. The formal structure of the organization is thus a branching out from the delegator of arbitrary chains of delegates a, b, c...., n. By the conditions inherent in *delegate,* delegates may not act for themselves with their own power and authority; they "act for" the delegator.

With the structure of branching out chains of delegates a, b, c,...n goes a necessary doctrine—the infallibility of the head. The structure has seven inherent deficiencies: 1) Decision-making is impeded. A delegate may use entrusted power and authority only to be right in the opinion of the delegator. A delegate needs, therefore, the delegator's instructions or prior approval; he delays decision-making until he has such; and he avoids risky decisions. 2) The size of an organization is limited by how far along a chain the head's personality-force actuates delegates.

3) Delegation denies decentralization. 4) Collectively, functions by arbitrary designation are an *aggregate,* not a *system,* hence not a true organization. 5) Supervision is, primarily, overseeing *how* delegates "act for." 6) The structure is not in accord with the nature of free men with minds of their own for self-expression. 7) The structure has, basically, only one mind-power—its head (the delegator).

The waste of time, energy, and dormant mind-power is apparent. Waste is inefficiency. But true organization is efficient. Therefore the postulate is erroneous by its effect.

The alternative is the opposite: *contract and facilitate.* Any organization can assume its contract (a) calling for its intended accomplishment in its planned life. From contract (a) it can form a system—branching out lines of *generated* contracts b, c,... in descending degrees of abstractness for less and less broad situations until at 'n' a contract (n) is concrete, appropriate to one mind to actualize with or without assistants, with or without a machine to multiply human effort.

The contracts vary from tight to loose, narrow to broad, inflexible to flexible in accordance with the situation as do the needed contract-called-for contributions to the organization.

With reflection it is apparent that the seven deficient features in the aggregate of functions and delegates are sufficient in the system of contracts and contract-holders. ■

Author Kuhre may be contacted at P. O. Box 5274, San Antonio 1, Texas.

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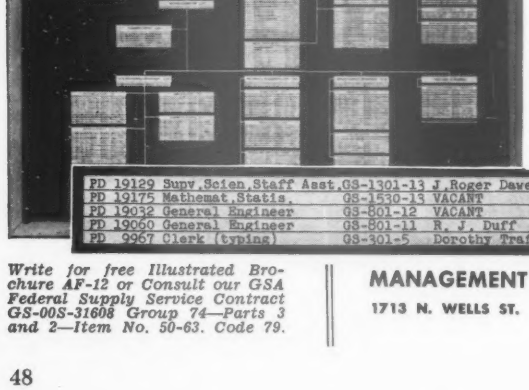
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MARKET YIELDS AND THE FUTURE

What happens to common stock yields in a declining market?

The question, in a way, is deceptively simple. One obvious answer is that yields advance if prices decline and dividend rates are maintained.

The indicated yield on a stock may be figured simply by dividing cash dividends paid in the preceding 12 months by the current price. If a stock sells at $100 a share and has paid $5 in cash dividends during the preceding year, the indicated yield is five per cent.

If, a year later, the price drops to $50 a share and dividends paid in the preceding year dropped to $2.50, the indicated yield to the investor at that time is still five per cent. Thus, it is just as logical to say that yields will hold their own in a declining market—if dividends decline proportionately.

Let's see what happened this year to a group of 25 stocks—selected at random—in terms of yield, price and dividends.

Twenty five issues broken down into various yield groups illuminate the normal ranges of the market. These stocks yielded from less than two per cent to five per cent and more.

During the period covered—from the end of 1959 through October 20 this year—the market generally, as measured by the Dow-Jones average of 30 industrial issues, dropped 96.7 points or 14.2 per cent. This was the largest decline for a similar period since 1937.

Some Up, Some Down

Sixteen of the sampling of 25 stocks in the table posted losses. Some were quite sizable—General Electric slipped from $99.12 a share to $73.75 and U.S. Steel from $98.62 to $74. On the other hand, nine scored gains—and some of these were quite sizable. Gillette Co. moved from $63.62 to $82.62 and H. J. Heinz from $90.75 to $115.

Now what happened to dividends during the period under study? Nine of the 25 stocks paid larger dividends. Fifteen paid the same amounts and only one issue (Allied Mills) paid a smaller amount.

For these 25 stocks, then, we have this situation: A majority registered price declines—but 24 out of 25 either maintained their dividends or increased them in a declining market.

Eighteen of the 25 issues showed increased yields on Oct. 20, compared with the end of 1959. The yield on six were smaller and one was unchanged.

What is Yield?

Yield is commonly assumed to be one of the best gauges for judging the investment merits of a stock and there is some merit to this argument. It should be remembered, though, that these yields are essentially an expression of past performance rather than a promise for the future.

It is only when a company has an exceptionally steady record as a dividend payer—that is, the same or an increasing dividend rate has been recorded over a period of years—that yield can be regarded as a valid investment factor.

But, for the more erratic dividend payers, yield may actually be misleading. The stock you buy at $50 a share today, and has paid $2.50 a share in the preceding 12 months, has an indicated yield of 5 per cent. But if in the next 12 months the dividend drops to $1.25 a share, your yield on your original investment declines to 2.5 per cent.

It should be emphasized that the market and dividend action of the 25 stocks should not be considered conclusive. They were selected only for purposes of illustration.

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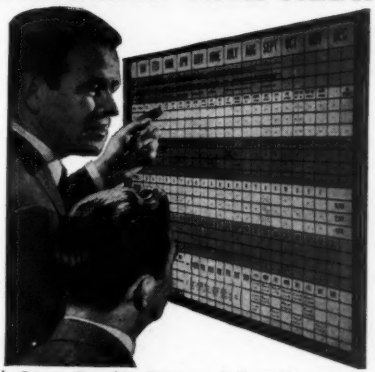

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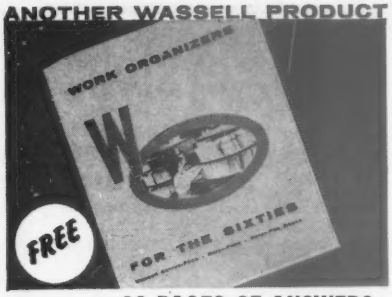

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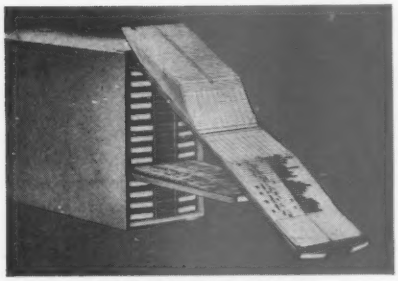

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Industrial Funding . . .

(continued from page 36)

But it seems that Defense has gone considerably beyond industry in preparing cost analyses and reports to satisfy Congress, not management improvement.

The basic concept (necessarily in retrospect) seems to follow the theory "what's good for industry is good for the military."

Officers experienced in industrial fund operations credit cost analyses with spotting poorly organized production practices; in other cases they showed up feather-bedding. Using the analyses as evidence, NIF supporters show it was possible to improve productivity.

This is good. That's what the working-fund concept was designed to do. But it also creates the "empire of the Comptroller," with tremendous authority plus an elaborate, intricate system.

While all this *may* be good peacetime practice, it would seem to be so elaborate and so intricate that without advanced training (the Rensselaer Polytechnic Institute course, the one in Comptrollership at George Washington, or the one in Middle Management at Monterey) the program could not be effectively continued under the strain of a national emergency.

Regular officers simply could not be made available for training.

Simplification is needed, and should be made an expressed objective in any subsequent Defense directive.

Further it should not be forgotten that while sound financial management is essential there are other essential tools of management. This is well expressed in an introduction to the Navy Industrial Fund Program:

"It must be emphasized that the installation of the Industrial Fund and its related business-type accounting system at an industrial commercial type activity is, in itself, no guarantee of efficient operation. However, many of the basic tools for dynamic management are inherent in the system."

What is left unsaid is that the most basic tool of management is line authority at local level.

Based upon experiences in several Navy industrial activities plus research for this article, the author's feelings regarding the actual effectiveness of the Navy Industrial Fund operations are best expressed by: "decision reserved."

In another light, the industrial fund concept can be seen as an engineered psychological approach for restoring authority to management using a technique currently in vogue. ■

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Consolidated General Products	42
Continental Motors Corp.	31
English Electric Co.	37
Girdler Corp.	2
Graphic Systems	49
Hamilton Management Corp., The	47
Hughes Aircraft Co.	14, 15
Keystone Co. of Boston	49
Lockheed Aircraft Corp. Georgia Div.	6, 7, 40
Missile & Space Div.	12
Management Control Charts Co.	48
McDonnell Aircraft Corp.	52
Monsanto Chemical Co.	32, 33, 34
Northern Ordnance Inc.	46
Philco Corp.—Government & Industrial Group	8
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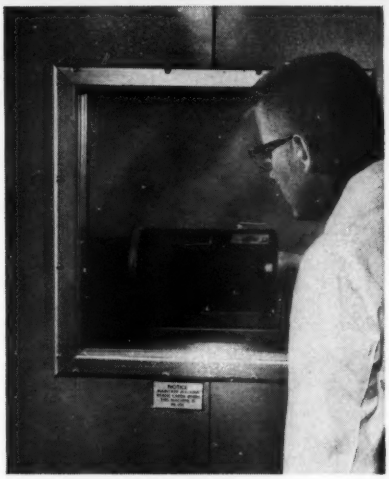

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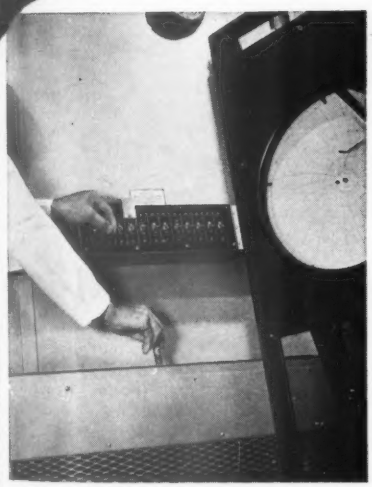

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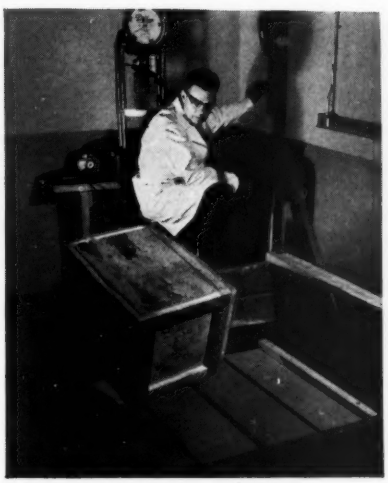

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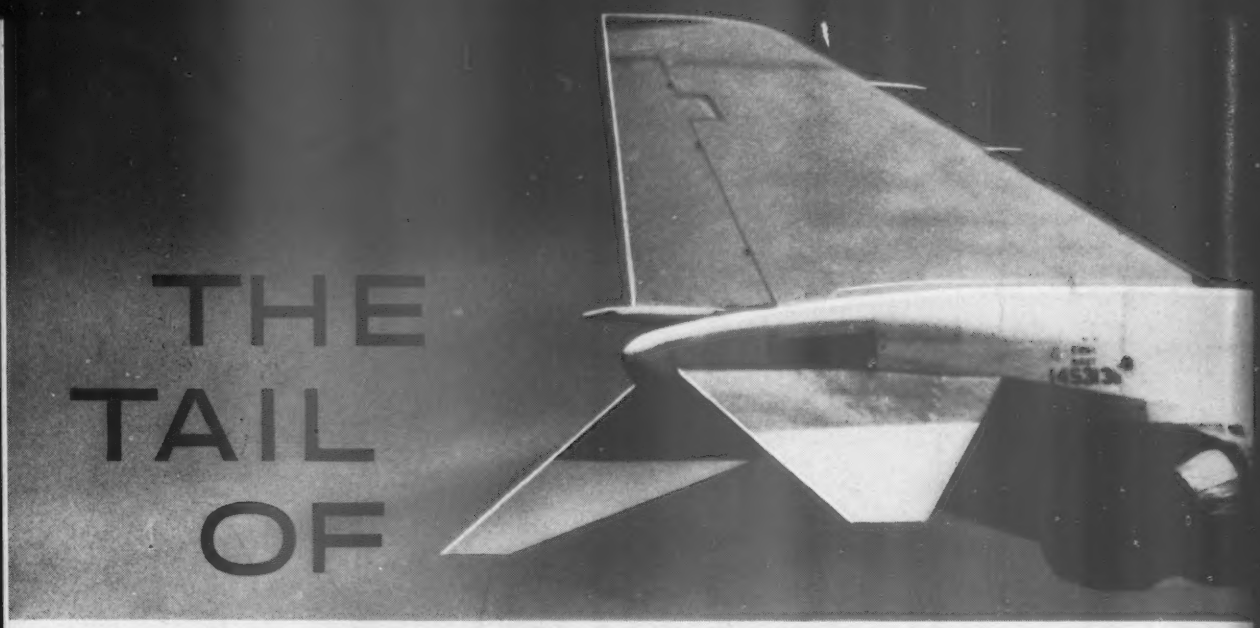

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